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CONTRIBUTIONS TO THE STUDY OF THE INTERNAL SECRETING GLANDS IN FILIPINOS, I

TOPOGRAPHY AND SIZE OF THE THYMUS

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ONE PLATE AND FIVE TEXT FIGURES

INTRODUCTION

Although there is, as yet, no definite functional entity that is clearly attributed to the thymus, and no uniformity of physiological reactions or of clinical manifestation is observed under varying degrees of change in size, topography, and morphology of this organ, conditions that have caused it to be named the "enigmatic organ" of the human body; yet because of the apparent indispensability of this gland, both to lower forms and to man, and of its close physiological relationship with the many other ductless or endocrine glands and lymphoid tissues of the body, and because of the significant influence that these have upon the form, type, and extent of physical growth of the body systems, in different families and races of people, it becomes of importance and of interest to know the actual degree of development and the true anatomical state in which this gland is found in Filipinos.

Racial differentiation, anthropologically and morphologically, is known to be brought about in some way by the varying influence of the secretory activity and alteration in the harmonic balance of the internal secreting glands of the body. From analogy, from observations on certain diseases affecting some of these glands, it has been claimed that variations or changes in

their secretions tend to produce certain distinct anthropologic types, with the predominance of such characteristic anatomical features as those found in the mongoloid, acromegalic and cretins, and infantile forms of development. Although many other factors undoubtedly help in the formation of the very numerous shades of forms and appearances of the external features in the developmental processes of man, from one extreme to another, yet the part played by the endocrine organs is believed to be as fundamental and as inherent as the influence of heredity. These two factors, aided by the nutritional and environmental secondary influences, are the preëminent and dominant controls now known to influence such body processes. Study of the internal secreting glands in Filipinos will help disclose some of the distinct morphologic and developmental standards characteristic of the Filipinos as they should be studied in anatomy, and as bases for the collateral studies in physiology, pathology, biochemistry, and other medical sciences that directly concern the race. Their study, particularly those of the thymus and thyroid, will probably offer likewise some clue to the time-extent of the various phases of growth and development as met with in the intrauterine, childhood, adolescent, and senile periods of life in Filipinos.

Nothing definite is known about the normal or common condition of development of the thymus in Filipinos, and collaterally practically nothing is known either of its peculiarities or of its abnormalities and pathology as they occur in the Tropics and in the race. It is, of course, essential that we primarily and fundamentally know what is the normal or ordinary state of this organ in the body to enable us to distinguish what is unusual or abnormal. It is thus the purpose of this paper to present primarily, in a preliminary way, the findings obtained from our study of the position, topographic relations, size, weight, and dimensions of the organ as actually found in Filipinos.

CONSTITUENT ELEMENTS AND EMBRYOLOGY OF THE THYMUS

All the anatomical features and experimental facts so far found about the thymus tend to show that this organ, like some of the other structures of the body known as internal secreting glands, really possesses more than one function and that such functions are in direct and in collateral relation with the two fundamentally different and morphologically distinct structures of the thymus; namely, the medulla, with its concentric corpuscles of Hassal, of strictly epithelial origin, and the cortex, with

its characteristic lymphoid tissue contents, which are of mesenchymal source. These two structurally distinct parts are now recognized as of fundamental significance in the rôle they play in the proper growth of the variôus body structures and systems, and in the right maintenance of the normally balanced functions between the different internal secreting organs of man.

The two structures, the epithelial and the lymphoid portions, taken together, constitute the main bulk of this gland. This organ is known to appear in the embryonic stage as an involution of the pharyngeal entoderm from each side of the future pharynx. It soon separates from this origin and becomes an independent structure, which then takes its place in the lower cervical and upper thoracic regions in man. The entodermal anlage of this organ becomes the concentric corpuscles of Hassal, and it is the specific and fixed element of the thymus. The lymphoid tissue contents of the cortex are of mesodermal or mesenchymal derivation, and they are at present regarded as an immigrant or accretion element of the thymus. It has been stated, and to a certain extent accepted, that the thymus continues to enlarge in size and in volume to the second year of life. From this stage to the period of puberty it remains stationary. Upon reaching the age of adolescence it begins to diminish in size at a slightly varying rate, although it is found that it does not completely disappear. A certain portion of it usually persists, which is believed to continue to exercise some functions during the entire life-time of the individual. In fact, it is now presumed that the diminution in size of the organ is due only to an emigration of the lymphoid tissue element, and that the epithelial part is not much affected and persists for a longer period.

As to how the evolutionary changes enumerated actually occur in the different stages of life in Filipinos, and at what rate and to what limit this organ continues to grow in the race; and once its maximum size and usefulness are reached, what relative extent of regressive changes is undergone by this organ, are questions and problems of intriguing interest and importance, especially in connection with the study of those problems directly related to the physical and constitutional make-up of the race. Such problems are closely allied to the various processes of body growth and development and are intimately related to the different alergic conditions inherently connected with the resistance of the body systems to various diseases that are commonly observed in Filipinos. To help solve the aforesaid

problems on the growth condition of the thymus in Filipinos, there are, of course, required many painstaking observations on actual human material that should be comprehensive enough to cover the entire span of life. It is obvious that the study on the topography, dimensions, and ponderal condition of the organ calls for the first attention; and, therefore, it is the first inquiry and study that is followed and here presented. We hope that other problems, of a more-advanced nature, on the study of the thymus can be attended to later.

MATERIALS AND METHODS

For this study of the thymus there were dissected, examined, and measured 338 bodies, both fresh and embalmed, that ranged in age from birth to 15 years. There were 202 males and 136 females. These cases were divided into three series for age-grouping and for other technical reasons. The first series includes those full-term stillborns or newborns who died during or soon after delivery. In these cases all the important body dimensions were taken, and the thymus was carefully dissected out, measured, traced, and its topography carefully studied. This group numbered 29 cases, of which 17 were males and 12 were females. The members of the second series were newborns 24 hours to 2 days of age, in which the body dimensions were also taken and the dimensions and weight of the gland were also carefully recorded though its topography was not traced. There were in this group 164 cases, of which 100 were males and 64 were females. The third series comprised those cases that had lived from 2 days to 15 years. In this group the thymus was carefully measured in autopsy, although no tracing of its topography could be made. This series numbered 145 cases, of which 85 were males and 60 were females.

It is to be mentioned, in this connection, that many of the cases belonging to the first series were fairly well-developed and well-nourished fœtuses, as shown by their appearance and weight. Many of them, as reported in their obstetrical record and as found in autopsy, died during their prolonged or difficult delivery, either through traumatic injury or through asphyxia suffered during parturition, as frequently happens in fœtuses that are fairly large. The cases belonging to the second series were of various degrees of body nourishment; some were fairly well developed while others were quite emaciated. In both of these two newborn series no material was included showing any gross pathological condition or abnormal development of the body.

The third series consisted to a great extent of poorly nourished, underweight children. The older ones, particularly had suffered from one form or other of gastrointestinal troubles from which many of them had died an early death.

The newborn fœtuses of the first and second series belong to the collections of embryos, fœtuses, and newborns of the Department of Anatomy of the College of Medicine, University of the Philippines. These were gathered from various sources—mainly, hospitals and charity institutions in Manila for the last few years—and are intended primarily for various other studies on the subject of embryology, growth, and physical development of the Filipinos.

The study of the thymus in the first group was made after the bodies had been embalmed to provide sufficient hardening of tissues and organs indispensable for the exact topographical study of the gland and to insure certain fixed points of reference in these specimens during the process of tracing and graphic reconstruction as recommended by Scammon in the use of his graphic reconstruction apparatus. The studies that were followed over the second and third series of cases, however, were all done in necropsy when the specimens were yet fresh and unembalmed. These cases were those received in the City Morgue from all parts of the city and were autopsied within forty-eight hours after death. Adequate mathematical computations and the necessary quantitative determinations were made and allowances given in determining the ponderal and dimensional conditions of the thymus when fresh, on the one hand; and when preserved, on the other, for the necessary comparative standing of the data derived from the three series. The details of the process of this computation have purposely been omitted in this report.

The embalming fluid used in all the preserved specimens is 10 per cent aqueous solution of formaldehyde injected into the great vessels of the thigh and neck. This same solution is used in the preservation tanks wherein all our specimens are immersed and kept.

In exposing the thymus there were reflected primarily the skin, subcutaneous tissues, and superficial musculatures of the anterior surfaces of the neck and chest. Several definite points of reference were first determined and securely designated by long pins through the chest. A complete tracing of the exposed cartilagenous and bony framework of the chest was then made on coördinate paper, under the reconstruction glass platform of

Scammon's reconstruction apparatus with the aid of his tracing ocular (Plate 1). Once this was completed, the entire anterior bony and cartilagenous framework of the breast (the sternum, costal cartilages, clavicles, and ribs) was detached by lateral incisions along the mid-clavicular and anterior axillary lines of both sides. The sternomastoid and infrahyoid muscles were dissected and reflected upward. After this dissection, there were naturally exposed the anterior mediastinum and part of the pleural cavities on each side containing the lungs, together with the larynx, thyroid and thymus glands, and the pericardium as they were seen from the anterior aspect. By the same procedure, an accurate outline tracing of the gland was then made on the same tracing of the bony framework of the thorax. All the twenty-nine cases of newborns belonging to the first series were traced and plotted identically in this manner. All the tracings were made after the important stage of dissection was finished. This is done for the purpose of studying closely the exact topographical position of the thymus in reference to the other structures of the neck and trunk closely related to it. The various dimensions of the organ were then taken with fine-pointed calipers to ten-hundredths of a millimeter. The posterior topographic relations of the organ were then exposed and traced on the tracings already made of the superficial structures and thymus.

The author desires to acknowledge, in this connection, the valuable help rendered by Dr. Braulio Borlaza in doing some of the initial dissection of our cases at the beginning of our work. Doctor Borlaza was formerly an instructor in the Department. His stay with us was cut short by his unexpected sickness, hence his valuable assistance in this particular line of investigation was early interrupted.

RELATIONS, POSITION, AND FORM OF THE THYMUS

In the fresh condition the thymus is pale grayish pink, soft in consistency, slightly less resistant than the atelectatic lung of the newborn, and molds itself to the surrounding structures quite easily. Under such conditions, the dimensional measurements and the topographic determination of the position of the gland are not securely obtained—hence, fixation in situ is advisable before such observations are recorded.

The immediate relations of the thymus vary slightly with its size and shape. The extent of its contact with other structures in the mediastinum depends upon various factors; such as, the

degree of growth of the organ itself, the extent of the medial expansion of the lungs on either side, and the relative inclination and expansion of the heart at the postero-inferior side of the thymus. The manubrium and the upper part of the body of the sternum are immediately anterior to the gland as also frequently are the cartilages of the first three ribs, and even of the fourth and fifth, occasionally. The extent of their contact depends upon the limits of the transverse diameter of the thymus, which may reach from 0.5 to 1.5 centimeters beyond the lateral borders of the sternum. The cervical portion of the thymus is covered anteriorly by the sternohyoid and sternothyroid muscles with the deep cervical fascia intervening between. It rises as high as 2 centimeters above the superior border of the manubrium. Posterior to the thymus are found the left innominate vein, which obliquely crosses it; the inferior thyroid vein, and the inferior vena cava. Lower, and also in contact with the thymus, is the pericardium, which covers the atria, the arch of the aorta, and the trunk of the pulmonary artery. Part of the pericardium covering the right ventricle of the heart is also overlapped by the inferior border of the thymus, especially when the gland is elongated in shape and when lower in position. The posterior relations of the cervical portion are the trachea, the branches of the inferior thyroid vein, and the thyroidea ima. On each side, the lateral borders of the thymus are also in contact with the mediastinal reflections of the pleura, which are occupied inside by the anterior edges of the lungs. These structures tend to encroach and press upon the lateral edges of the thymus medialward for a varying extent in the cases wherein the inspiratory distention has already been established.

Text figs. 1 and 2 are taken directly from the reconstruction tracings. They show the anterior and posterior relations of the thymus—fig. 1 in a fœtus that has not yet breathed and fig. 2 in a fœtus that has had respiration established.

From actual observation in the process of autopsy and dissection of our cases of over three hundred children, we did not find a single instance of enlarged thymus sufficient in volume to produce actual pressure obstruction against the surrounding structures. Such a condition has been frequently mentioned and attributed to this organ to help explain in many cases certain disturbances associated with respiratory difficulties in infants and young children. In fact the thymus appeared to us too soft when fresh, with an easily molding consistency, to produce

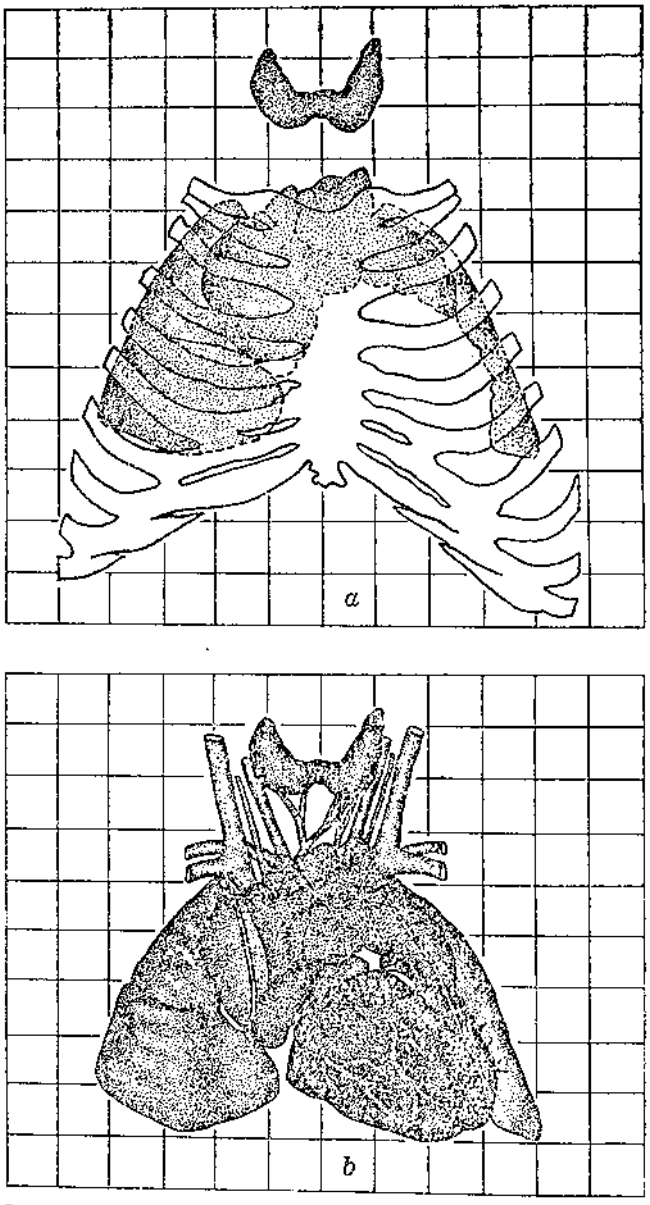

FIG. 1. Relations and topography of the thymus in a fœtus that has not yet breathed (case 24); *a*, anterior relations; *b*, posterior relations.

stenosis or pressure obstruction against the tracheobronchial tree and the lungs. What we have actually found is rather the reverse; that is, the pressure against the thymus resulting from

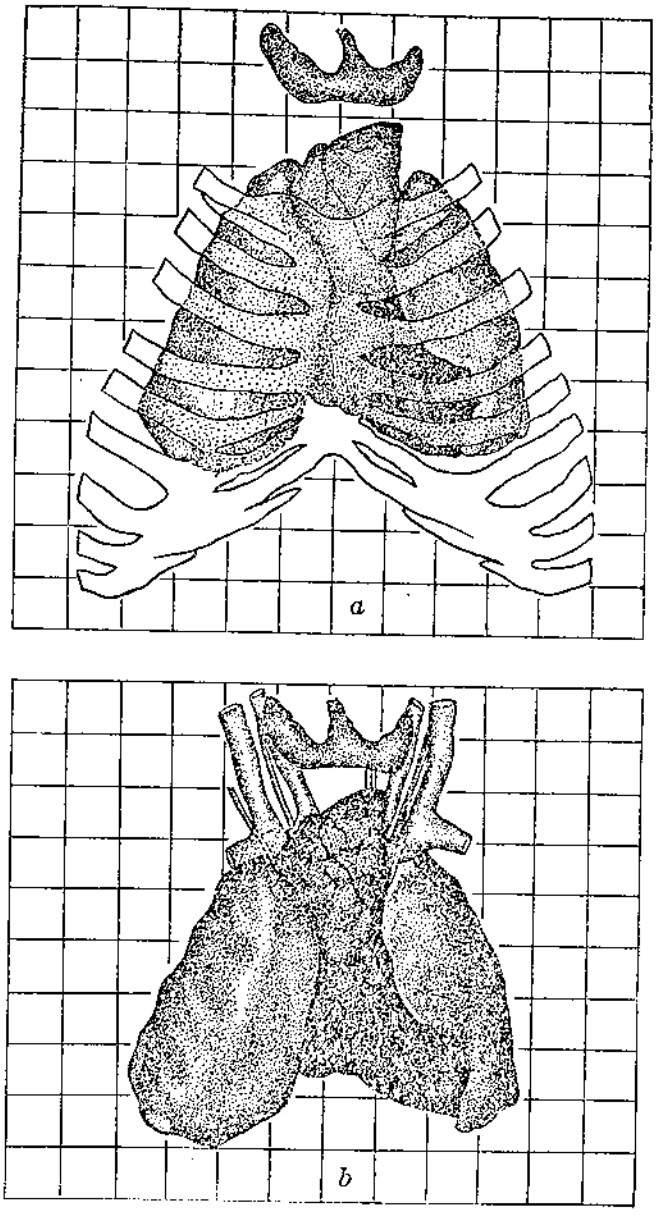

FIG. 2. Relations and topography of the thymus in a newborn that has had respiration established (case 22); *a*, anterior relations; *b*, posterior relations.

the expansion of the lungs was sufficiently effective to crowd the gland medially, and this is undoubtedly responsible for the production of the elongated form of thymus in children in

whom the respiratory function has been fully established. This condition will be described more in detail, presently, in the description of the position of this organ.

In regard to the position of the gland, we have observed that there is a preponderance of the thoracocervical location of the thymus in Filipino newborn children. This position has the greater portion of the gland in the thorax and the lesser part in the lower cervical region. This condition was found in 86.2 per cent of our newborn cases. On the other hand, the cervicothoracic position, where the main part of the gland is found in the cervical region and the lesser part in the thorax, was met with in only 6.9 per cent of our cases. The exclusively thoracic position of the thymus in our series was also found in 6.9 per cent of cases. There has not been seen a single case of newborn where the thymus was exclusively located in the neck.

In older children and young adults the exclusive thoracic position of the thymus was the one found with greater frequency. In the adolescent stage it was seen that a considerable number, around 65 per cent of cases, were of the exclusively thoracic location. In children around 5 years of age, however, the thoracocervical position of the organ still predominates, the frequency reaching about 72 per cent. These findings seem to indicate that with the normal growth-process of elongation of the neck and extension of the head, together with the expansion of the thorax from infancy to the adolescent stage, there exists collaterally a shifting of position of the thymus from the cervical to the thoracic region. This is probably effected, in one way or another, by such influences as organic pressure and tissue traction resulting from growth and changes of position of neighboring organs and structures in response to the alterations of the attitude of the head and thorax together with the direct influence of gravity. It is to be remembered that the condition of kinetic and dynamic tissue growth and expansion at this period of development, is in its highest expression. In fact the change of position of the thymus must be regarded as one of the many examples of the occurrence of such normal phenomena in the body.

A considerable range of variation was found in the form and shape of the thymus. The form is primarily and fundamentally influenced by the number of lobations of the organ during embryonic life, and secondarily, during the fœtal stage, by the effect of immediate contact or actual pressure exerted by the neighboring organs against the gland, more particularly by those actively moving or expanding organs of the thorax. The

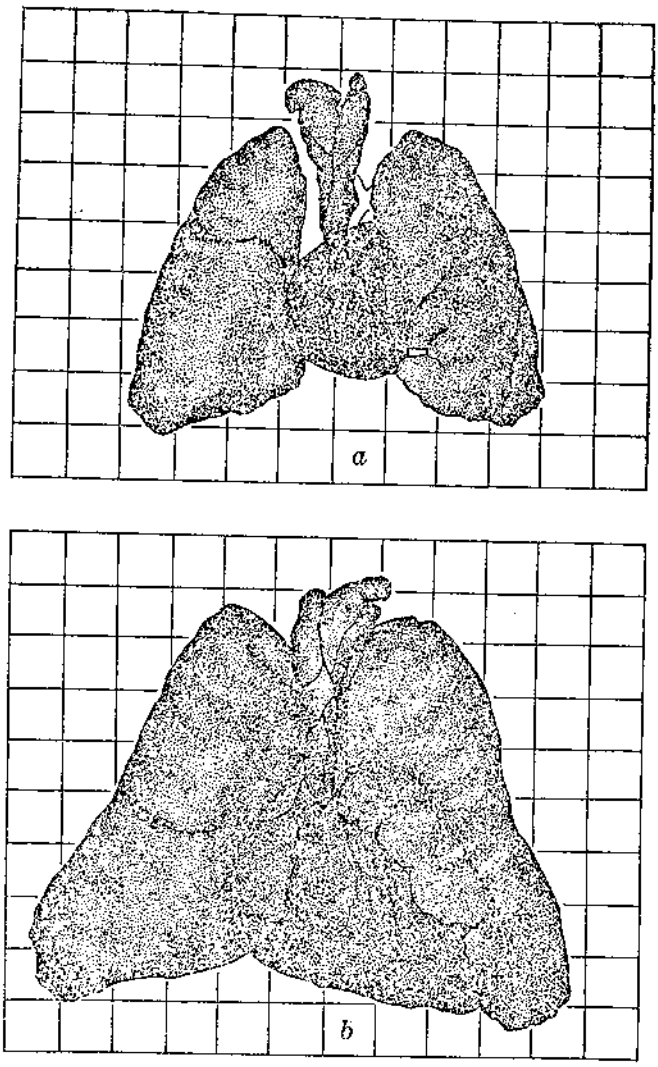

FIG. 3. Two typical forms of elongated thymus as produced by the pressure expansion of the lungs; *a*, case 7; *b*, case 18.

thymus may, of course, attain in its very early development, a unilobular, bilobular, and trilobular condition. If the division of the lobes is imperfectly attained or there is an apparent tendency of the lobes to fuse, this form is classified as conglomerate. Text fig. 4 represents the different forms of thymus as we have found them in situ. In our newborn series the bilobed condition of the organ reaches a frequency of 48.3 per cent. That of the conglomerate type is found in 34.5 per cent

of cases, while the trilobed condition is met with in only 17.2 per cent. If the transverse diameter of the whole organ is longer than the vertical diameter this is known as broad thymus. If the latter measurement, on the other hand, is longer than the transverse diameter, this type is known as elongated thymus. It was found in our series of newborns as similarly described by others for other races that the pressure exerted by the expanding lungs, encroaching on each side of the thymus, had much to do in determining the ultimate shape of this gland. It was obvious that there was a tendency for the anterior borders of the two lungs to press and crowd the lateral borders of the thymus towards the median line at the onset of active respiration. This pressure would naturally help reduce the transverse diameter of the gland, producing thereby an elongated type of thymus in many infants examined. What seemed to have happened in many instances at the beginning of the respiratory expansion of the lungs was the primary anterior overlapping of the lateral part of the thymus by the anteromedial edges of the lungs. This overlapping was in fact one of the most noticeable invariable signs of established respiration in all of our fœtuses that had already breathed. (See Table 3, the résumé of the series of twenty-nine fœtuses.) In older children, the constant encroachment and pressure by the lungs has produced permanent pressure-marks against the lateral sides of the thymus, thereby helping it to retain its elongated narrow position in the middle portion of the anterior mediastinum. Text fig. 3, *a* and *b*, shows two typical forms of this elongated thymus as produced by the pressure-expansion of the two lungs. (Cases 7 and 18, respectively.)

SIZE AND WEIGHT OF THE THYMUS IN THE NEWBORNS

The mean weight of the thymus for the male full-term newborns is 8.1 grams. The maximum weight observed is 16.2 and the minimum is 0.9 gram. For the female newborns the mean weight is 5.5 grams, with the maximum and minimum weights 11.3 grams and 0.9 gram, respectively. The two extremes of the weight of the thymus found for the two sexes show that there exists a wide extent of variation in the ponderal condition of this organ in Filipino newborns. We have observed this condition very early in our necropsies of these children and it appealed to us as indicating that the great degree of variation existing in the state of nutrition and body weight of these children may really have been responsible for the wide ponderal

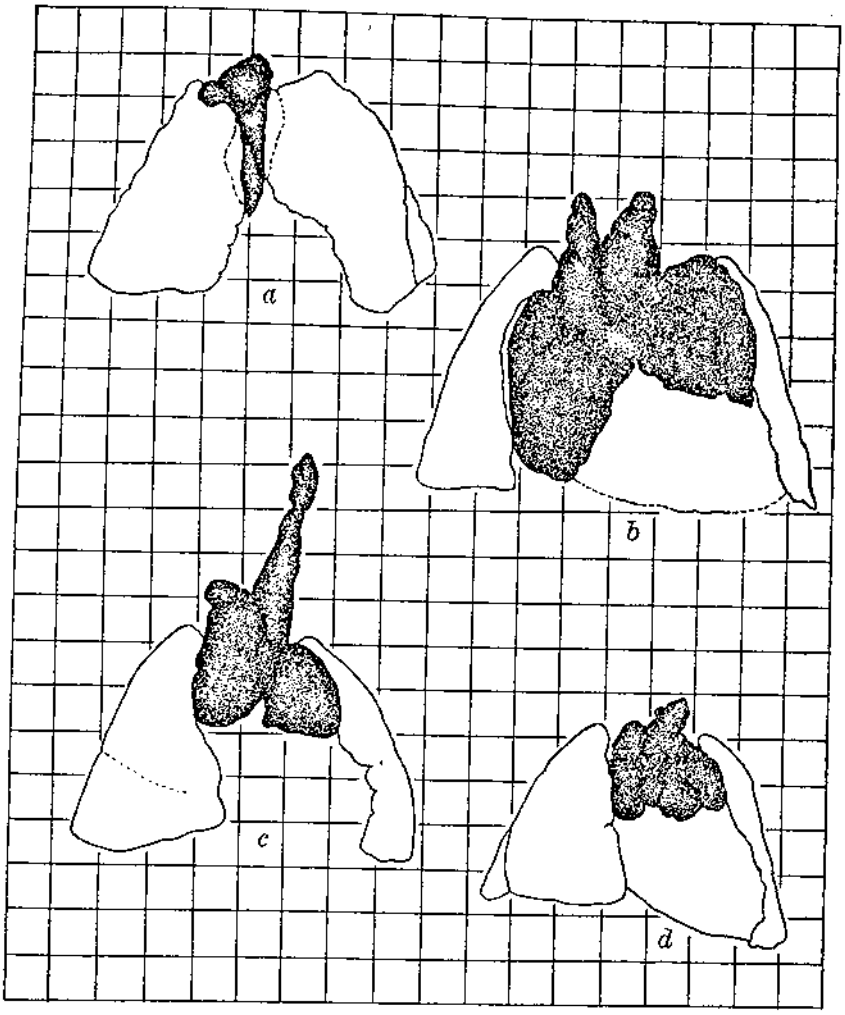

FIG. 4. Different forms and shapes of the thymus; *a*, unilobar type, case 20; *b*, bilobar type, case 9; *c*, trilobar type, case 16; *d*, conglomerate type, case 23.

variation of the thymus observed. This will be discussed further in the latter part of this paper.

The dimensions of the thymus for the male newborn give the mean values of 43.7 and 36.6 millimeters for the length of the right and left sides, respectively; 37.5 millimeters for the mean breadth and 14.0 millimeters for the mean thickness. The maximum and minimum ranges of these dimensions are given in detail in Table 1. In the female newborn the mean lengths of the right and left sides of the gland are, respectively, 28.4 and 30.0 millimeters. The mean width found is 34.0 millimeters and

TABLE 1.—*Mean, maximum, and minimum values of body measurements and dimensions, weight, and module of the thymus with their highest frequency distribution in Filipino newborns (series of 29 cases).*

MALE SERIES.

Measurements.	Mean.	Maximum.	Minimum.	Range of highest frequency.	
				Actual value.	Per cent.
Standing height.....cm..	43.1	33.0	37.0	35- 45	75.0
Sitting height.....cm..	28.8	30.0	24.5	26- 28	43.7
Body weight.....g..	2,319.8	3,743.0	1,573.0	1,500-2,500	75.0
Body volume.....cc..	2,269.1	3,650.0	1,450.0	2,000-2,400	37.5
Circumference of thorax....cm..	28.7	34.5	24.0	24- 28	50.0
Circumference of head.....cm..	31.5	36.0	28.0	28- 32	75.0
Measurements of thymus:					
Weight.....g..	8.1	16.2	0.9	0.5- 10	75.0
Length—					
Right side.....mm..	43.7	71.0	28.0	.....	.....
Left side.....mm..	38.6	69.0	22.0	.....	.....
Breadth.....mm..	37.5	61.0	16.0	.....	.....
Thickness.....mm..	14.0	44.0	8.0	.....	.....
Module.....	30.6	52.6	18.5	25- 35	55.3

FEMALE SERIES.

Standing height.....cm..	42.0	52.0	37.5	35- 45	84.6
Sitting height.....cm..	27.8	34.7	24.5	24- 26	38.4
Body weight.....g..	2,036.0	3,744.0	1,180.0	1,000-2,000	61.5
Body volume.....cc..	1,972.3	3,650.0	1,120.0	1,200-2,000	61.5
Circumference of thorax....cm..	28.2	37.0	22.8	23- 31	61.5
Circumference of head.....cm..	31.6	42.0	25.0	26- 34	69.2
Measurements of thymus:					
Weight.....g..	5.5	11.3	0.9	0.5- 10	84.6
Length—					
Right side.....mm..	28.4	39.0	18.0	.....	.....
Left side.....mm..	30.0	38.0	19.0	.....	.....
Breadth.....mm..	34.0	58.0	14.0	.....	.....
Thickness.....mm..	13.0	54.0	2.0	.....	.....
Module.....	26.2	36.0	17.3	15- 20	38.4

the mean thickness is 13.0 millimeters. Therefore, there is seen, relatively, a smaller size of thymus in the female than in the male in corresponding parallel to the lesser mean weight of the organ in the former. From the comparative standing of the maximum and minimum values of the various dimensions of the thymus, as shown in Table 1, it is noticed that there is wider variation in the thickness than in the breadth, and that in the latter dimension there is also a greater variation than is found in the mean length of the organ. These relative con-

ditions of variations in the three dimensions of the gland are true for both the male and the female newborns of our series.

TABLE 2.—*Frequency distribution of standing height of newborns with the actual averages of sitting height, body weight, and volume and the weight and module of the thymus (series of 29 cases).*

Standing height.		Cases.	Frequency.	Sitting height, average.	Body weight, average.	Body volume, average.	Thymus.	
Range.	Average.						Weight.	Module.
cm.	*cm.*		*P. ct.*	*cm.*	*g.*	*cc.*		
35–40	34.8	10	34.5	26.0	1,635	1,572	4.3	25.4
40–50	42.7	13	44.9	27.9	2,100	2,060	6.3	29.2
45–50	47.9	3	10.3	32.0	3,023	2,583	10.7	33.4
50–55	52.3	3	10.3	34.5	3,623	3,566	8.7	33.3
Total		29	100					
Mean value for the series				30.1	2,595	2,445	7.5	30.1

The mean value of the module of the different dimensions of the thymus of the newborns is 30.6 millimeters for the male and 26.2 millimeters for the female. The maximum and minimum module values recorded are, respectively, 52.6 and 18.5 millimeters for the male and 36.0 and 17.3 millimeters for the female. These figures further show correlatively the existence of a relatively smaller size of the gland in the female group.

It is also to be mentioned, in connection with the last point, that there is invariably shown in all the body measurements taken of these newborns, the presence of a lower condition of mean values in the females, both in dimensions and in weights. Thus, in the standing and sitting heights of these fœtuses the values for the male are, respectively, 43.1 and 28.8 centimeters, whereas in the female they are, respectively, 42.0 and 27.8 centimeters. In the body weight and body volume the mean values are, respectively, 2,319.8 grams and 2,269.1 cubic centimeters for the male; while they are, respectively, 2,036 grams and 1,972.3 cubic centimeters for the female. Even in the position of the highest frequency group of these various measurements as shown in Table 1, there exist likewise relatively lower linear, ponderal, and volumetric values for the female series.

The highest values of frequency distribution of the various measurements of the thymus in the series of twenty-nine cases are given in Table 2, and the complete record of measurements of each case in the group is found in Table 3.

TABLE 3.—*Complete record of measurements of the 29 cases of newborns with thymus carefully dissected, traced, and measured, and relations recorded.*[a]

Serial No.	Number.	Standing height.	Sitting height.	Sex.	Body weight.	Body volume.	Circumference, thorax.	Circumference, head.	Thymus.								Lungs expanded or not.	Thymus overlapped or not.	
									Form.	Lobes.	Position.	Weight.	Length.		Breadth.	Thickness.	Module.		
													R	L					
		cm.	*cm.*		*g.*	*cc.*	*cm.*	*cm.*				*g.*			*mm.*	*mm.*			
1	6	36.0	25.5	M	1,600	1,450	24.5	29.0	E	Bi	Tc	3.3	37	31	27	8	23.0	+	+	+
2	28	36.5	26.5	M	1,573	1,565	24.0	28.0	B	Bi	Tc	7.4	29	38	34	15	27.5	+	—	—
3	11	37.0	24.5	M	1,653	1,600	26.0	31.5	Eb	Tri	Tc	4.4	48	23	44	9	29.5	—	—	—
4	10	37.5	25.5	F	1,342	1,310	25.0	27.0	B	Bi	T	5.6	31	31	42	11	28.0	+	+	—
5	8	38.0	24.5	F	1,368	1,350	24.5	25.0	Bb	Bi	Tc	0.9	18	20	32	4	18.3	—	—	—
6	23	38.3	26.7	F	1,851	1,800	26.8	31.6	Bb	Co	Tc	2.2	27	19	25	8	18.7	+	+	+
7	1	39.0	26.5	F	1,180	1,120	22.8	30.5	B	Co	Tc	1.3	20	21	25	8	19.8	+	+	+
8	4	39.5	25.8	F	1,820	1,600	27.0	29.5	B	Co	Tc	8.3	34	38	43	13	30.6	+	+	—
9	19	39.5	27.3	M	1,910	1,900	27.4	30.8	E	Co	Tc	2.7	40	31	34	11	26.8	+	+	+
10	16	39.5	27.5	M	2,055	2,030	28.5	30.5	E	Tri	Tc	6.8	32	64	34	14	32.0	+	—	—
11	5	40.0	25.0	F	1,477	1,450	19.5	29.0	Bb	Bi	Tc	3.6	22	31	41	7	21.8	—	—	—
12	15	41.0	26.0	F	1,733	1,700	26.0	29.5	B	Bi	Tc	8.6	39	38	45	14	32.5	—	—	—
13	21	41.8	26.7	M	2,030	2,050	28.2	31.9	EB	Bi	Tc	9.6	52	46	44	11	34.6	—	—	—
14	24	41.8	28.2	M	2,404	2,350	29.8	32.5	Bb	Bi	Tc	10.4	39	31	48	18	33.6	—	—	—
15	7	42.0	28.0	M	1,645	1,600	25.5	30.0	En	Co	Ct	0.9	35	22	16	11	18.5	+	—	—
16	26	42.5	28.5	M	2,188	2,100	27.8	29.8	B	Bi	Tc	11.9	71	69	44	44	52.6	+	+	+
17	14	43.0	28.5	F	2,037	1,980	37.0	42.0	En	Co	Tc	1.9	30	35	16	10	19.5	+	+	+
18	22	43.4	29.2	M	2,320	2,320	30.1	31.3	E	Co	Ct	2.8	28	26	22	8	19.0	+	—	—
19	20	43.4	28.5	F	1,772	1,780	28.2	31.2	En	Co	Tc	1.9	29	29	21	2	17.3	+	+	+
20	29	43.5	28.0	F	3,017	2,950	33.6	33.2	Bb	Bi	Tc	11.3	34	37	14	54	34.5	—	—	—
21	3	44.0	27.5	M	2,227	2,150	28.0	30.5	E	Tri	Tc	7.8	43	48	39	11	31.8	+	+	+
22	13	44.0	28.0	M	1,975	1,950	27.2	31.0	Eb	Bi	Tc	8.5	35	30	32	8	24.1	+	+	+

23	17	45.0	31.0	F	2,470	2,400	29.5	33.0	B	Tri	Tc	8.1	26	32	58	18	36.6	+	+	+
24	27	46.5	31.5	F	2,657	2,550	30.5	34.3	Bb	Tri	T	6.8	31	29	46	8	28.0	+	+	—
25	2	47.3	32.5	M	2,670	2,550	30.2	31.8	E	Bi	Tc	9.1	29	44	32	21	29.8	+	+	+
26	9	50.0	32.0	M	3,743	3,650	34.0	36.0	Eb	Bi	Tc	16.2	64	47	57	15	42.6	+	+	—
27	12	52.0	33.0	M	2,670	3,600	34.5	34.5	Eb	Bi	Tc	14.0	65	54	61	9	43.1	+	—	—
28	25	52.0	34.7	M	3,744	3,650	35.4	36.2	E	Co	Tc	10.7	54	31	50	12	34.8	+	—	—
29	18	53.0	36.0	M	3,455	3,450	33.4	35.5	En	Co	Tc	1.5	42	22	21	13	22.0	+	+	+

[a] Frequency of types: Bi, 14, or 48.27 per cent; Tri, 5, or 17.24 per cent; Cong, 10, or 34.49 per cent. Frequency of position: Ot, 2, or 6.9 per cent; Tc, 25, or 86.2 per cent; T, 2, or 6.9 per cent.

The ponderal and dimensional states of the thymus in the second series of newborns—those that lived up to the second day of life (consisting of 164 cases)—have consistently shown slightly higher values when compared with those obtained from the first series—cases who died during or soon after delivery (29 cases). Table 4 represents the actual distribution of the series grouping of the one hundred sixty-four cases showing the weight and module of dimensions of the thymus, together with the sitting height and body weight of the group. It will be observed that approximately 60 per cent of this series are within the standing height group of 40 to 50 centimeters, with the rest falling more below than above this height interval. A parallel comparison of these data with the records of measurements gathered from the first series, as given in Table 2, has shown that although in body weight those of the second series are generally lower by approximately 200 grams, yet in the weight and module of the thymus, they are consistently heavier and slightly larger. In fact, the weight of the thymus in the second series is from 30 to almost 100 per cent greater than that in the first group. In reference to the module of dimensions of the gland, although it is also relatively higher in this series, the existing difference is not as great as in the case of weight. All these comparative findings are readily seen by comparing Tables 2 and 4.

TABLE 4.—*Frequency distribution of standing height, with the group averages of sitting height, body weight, and the weight and module of the thymus in newborns (series of 164 cases).*

Standing height.		Cases.	Frequency.	Sitting height.	Body weight.	Thymus.	
Grouping.	Average.					Weight.	Module.
cm.	*cm.*		*P. ct.*	*cm.*	*g.*	*g.*	*mm.*
30–35	33.7	18	19.98	24.0	946	8.8	20.8
35–40	38.4	20	12.19	27.3	1,314	8.1	27.2
40–45	43.0	52	31.71	30.6	1,851	11.4	32.1
45–50	47.8	45	27.44	34.0	2,623	15.3	36.1
50–55	52.4	21	12.80	37.4	2,995	14.8	37.1
55–60	57.8	4	2.44	38.1	3,848	10.2	34.7
60–65							
65–70	68.5	2	1.22	46.5	5,057	10.0	16.8
70–75	72.0	2	1.22	45.0	5,312	4.0	19.1
Total		164	100				
Mean values for the series				31.7	2,172	12.4	32.0

TABLE 5.—*Comparative table of averages of the height and weight of the body and the weight and module of the thymus from the two series of newborns and their mean averages.*

	Standing height.	Sitting height.	Body weight.	Thymus.	
				Weight.	Module.
	cm.	*cm.*	*g.*	*g.*	*mm.*
Series of 29 cases	41.4	30.1	2,595	6.8	30.1
Series of 164 cases	44.9	31.7	2,172	12.4	32.0
Mean average of 193 newborns	43.1	30.9	2,383	9.6	31.0

Such an unparalleled condition of the weight of the body on the one hand and of the weight of the thymus on the other in our two groups of newborns appear to us as probably due to the actual occurrence of that generally observed condition of initial loss of body fluid noticed soon after delivery. This postnatal loss within the first two days of life must have been the contributory factor that determined the lowering of the body weight in the cases of our second group. Whereas the body weight in the first series has been taken immediately after delivery and before the initial loss of fluid could have taken place, that of the second series was taken from several hours to two days after birth, certainly after some amount of body fluid must have been already eliminated. The thymus has not appeared to be affected at all by this process of loss of body fluid, as evidenced by our findings that neither in weight nor in dimensions the gland showed appreciable decrease. In all probabilities this organ, like the other ductless and nonexcretory organs in the body, ordinarily does not lose fluid after birth. On the other hand it seems quite true that the thymus continued to undergo a rather rapid postnatal growth and that the difference in weight noted between our two series of newborns, expresses the ponderal rate of growth of this gland from the time of birth up to the second day of life.

In the light of these findings it appears quite obvious that the thymus undergoes a fairly rapid growth or increased expansion in size within the first two days of extra-uterine life. Whether this is due to an actual proliferation and growth of the cellular elements of the gland or rather to the increased blood supply or to an accelerated circulation of the blood within the substance of the organ, we cannot very well tell until more-

comprehensive histological studies are made. At any rate, there seems to be sufficient indications to consider the above conditions as tangible expressions of the relative functional importance of this endocrine gland at this period of postnatal development.

Summarizing the ponderal and dimensional findings here noted as obtained from the two series of newborns of one hundred ninety-three cases, both male and female, as given together in Table 5, we have as follows: Standing height, 43.1 centimeters; sitting height, 30.9 centimeters; body weight, 2,383 grams; weight of thymus, 9.6 grams; module of the thymus, 31 centimeters.

SIZE AND WEIGHT OF THE THYMUS IN YOUNG CHILDREN AND ADOLESCENTS

Our records of measurements for older children are summarized in Table 6. It is regretted that we do not have a greater number of cases for the older series reported here. It will be seen from this table that cases over 100 centimeters in crown to heel length (approximately from the fifth year of age up) are not over twenty-four in number, and that their serial distribution runs from two to eight cases only. We fear that the number gathered for the age beyond the second year of life may not be comprehensive enough to warrant more than tentative conclusions. We are, therefore, presenting our observations and findings on this series as preliminary reports only, subject to revision when more material may be gathered and studied. It has been our experience for many years now that only a few pauper cases of older children and even much less of the age nearing adolescence, reach the City Morgue, where most of our cases are collected. So, necessarily our studies on the postnatal development of the internal organs find some interruptions at this age and more particularly at the preadolescent period of life.

As observed from Table 6, there takes place a gradual, though somewhat irregular, increase in the weight of the thymus from birth up to the standing height of 100 centimeters. At this stage the weight of the organ of the infant is already double that at birth. In the group between the standing height of 90 and 100 centimeters, corresponding, approximately, to the age

of 4.5 years, and in that between the height of 120 and 130 centimeters, corresponding to the ages of 8 to 11 years, there are seen considerably more ponderal increases in the weight of the thymus, reaching as much as 15.5 grams for the former group, and 31.1 grams for the latter. These marked increases, particularly that in the younger group, may probably be attributed to the variation in sampling of limited cases and may carry no developmental significance. On the other hand, they may really denote the true conditions in which this organ is found during these two age intervals. We will refer to this point again more in detail in an appropriate section of our discussion of the subject.

TABLE 6.—*Frequency distribution of standing height with the actual averages of age, weight of the body, and weight of the thymus in the cases that have lived from the second day up to the fifteenth year of life (series of 145 cases).*

Standing height.		Cases.	Frequency.	Age.		Average body weight.	Average thymus weight.
Grouping.	Average.			Limits.	Average.		
cm.	*cm.*		*P. ct.*			*g.*	*g.*
40– 50	45.7	22	13.8	2 days to 2 months	1.5 months	2,552	5.62
50– 60	55.0	34	23.4	1.5 to 13 months	3.8 months	3,373	4.78
60– 70	65.1	21	14.5	3.5 to 18 months	9.2 months	5,305	7.33
70– 80	75.6	20	13.8	9.0 to 36 months	26.0 months	6,791	6.17
80– 90	85.3	13	9.0	1.5 to 4 years	2.6 years	8,862	9.31
90–100	95.0	11	7.6	3.0 to 7 years	4.4 years	11,371	15.54
100–110	107.6	3	2.1	5 to 7 years	6.3 years	14,400	11.67
110–120	117.0	2	1.4	7 to 8 years	7.5 years	17,525	10.10
120–130	126–1	6	4.1	8 to 11 years	9.7 years	21,898	31.14
130–140	135.0	8	5.5	12 to 15 years	13.1 years	25,788	19.71
140–150	143.0	3	2.7	12 to 15 years	13.7 years	33,000	19.11
150–160	154.5	2	2.1	13 to 15 years	14.3 years	41,907	17.31
Total		145	100				

In the oldest and last three age groups of the table there appears to be a continuous increase in growth of the thymus, although in a relatively lesser degree than in the previous stages. It is noticed that at a standing height of 126 centimeters, corresponding to the age of about 9.5 years, the weight of the thymus is already four times that at birth. This ponderal condition remains uniformly sustained excepting only for a very slight retardation in one instance in the group, in the stage of 160 centimeters height, corresponding to the age of 15 years. The

rather abrupt increase in weight at the standing height of 126 centimeters may be interpreted as a heightened state of growth at that age with a probable collateral increase in the internal secretory function of the gland. It is, of course, known that at this age, especially in the male, the developmental processes of the body, more particularly in reference to longitudinal dimensions of body segments, are most rapid and that it is at this period of life precisely when the epiphysial ends of long bones lengthen the most. It may be possible that the highest normal activity of the thymus is exerted at this period of development. It is noticed also from the same table that the stages following this exacerbation in the increase of weight of the organ there is initiated a period of stationary or even of very slight decrease in the ponderal state of the gland, continuing and extending to the cases with a standing height of 154 centimeters, or approximately the age of 15 years, the highest age limit of this series.

TABLE 7.—*Summary table of measurements from all the series of cases (338) together with the percentage of the weight of the thymus to the body weight.*

Standing height.		Cases.	Body weight.	Thymus weight.	Percentage weight of thymus to body weight.
Grouping.	Average.				
cm.	*cm.*		*g.*	*g.*	
30– 40	35.6	48	1,298	7.06	0.543
40– 50	45.4	135	2,428	9.86	0.406
50– 60	54.3	62	3,459	9.62	0.278
60– 70	66.8	23	5,190	8.66	0.166
70– 80	73.6	22	6,051	5.08	0.083
80– 90	85.3	13	8,862	9.31	0.105
90–100	95.0	11	11,371	15.54	0.136
100–110	107.6	3	14,400	11.67	0.081
110–120	117.0	2	17,525	10.10	0.057
120–130	126.1	6	21,898	31.14	0.142
130–140	135.0	8	25,788	19.71	0.076
140–150	143.0	3	33,000	19.11	0.057
150–160	154.5	2	41,907	17.81	0.042

The ponderal state of the thymus when compared with the body weight shows a decreasing growth ratio from the time of birth up to the fifteenth year. Such a disproportionate condition of growth between the two is shown in percentage basis

in Table 7, and graphically presented in fig. 5. It is obvious from the table that the growth of the body in terms of weight, which is quite fundamental, advances much more rapidly than the weight of the thymus after birth and that this lagging is still greater as adolescence is approached. Thus, at the standing height of 30 to 40 centimeters, the proportion of the weight of the thymus to the weight of the body is around 0.54 per cent; at the height of 90 to 100 centimeters, its percentage relation to the body weight is only about 0.13 per cent, and at the height of 150 to 160 centimeters this proportion has dropped to 0.04 per cent. Of course, it is generally known, although not yet fully accepted, that the absolute weight of the thymus increases quite rapidly until the third year of life and is supposed to change but slightly to the seventh year, when the organ again starts gradually increasing in weight until the eleventh year. From this time the weight and dimensions of the organ are known to decrease rapidly. This course of growth is believed to be true for both sexes, only that at the eleventh year the gland is found to be larger in the female. In the present study we could not determine precisely and specifically these varying ponderal conditions of the thymus as observed in different ages, doubtless because of the limited number of cases studied in our series, which unfortunately cannot offer a fair number of age distribution throughout our age groupings. We have observed, however, that in our series there is an abrupt increase in the weight of the thymus at the standing height of 126 centimeters, approximately corresponding to the age of 9.5 years; and that following this rapid increase there is also a stationary or even a slight decrease in weight of the organ until the fifteenth year. We may presume from this that it may be possible that, with the distinctly different series we are dealing with the precise age period of rapid exacerbation of increased weight of the thymus, which normally happens at the seventh year of life in Caucasian children of temperate regions, may really occur at the ninth year of age in our children of Malayan stock and living in a tropical country. However, this presumption needs further study and verification through more-extensive observations of a larger and more-comprehensive series of cases. For the present we leave this tentative assumption as an open question subject to further study.

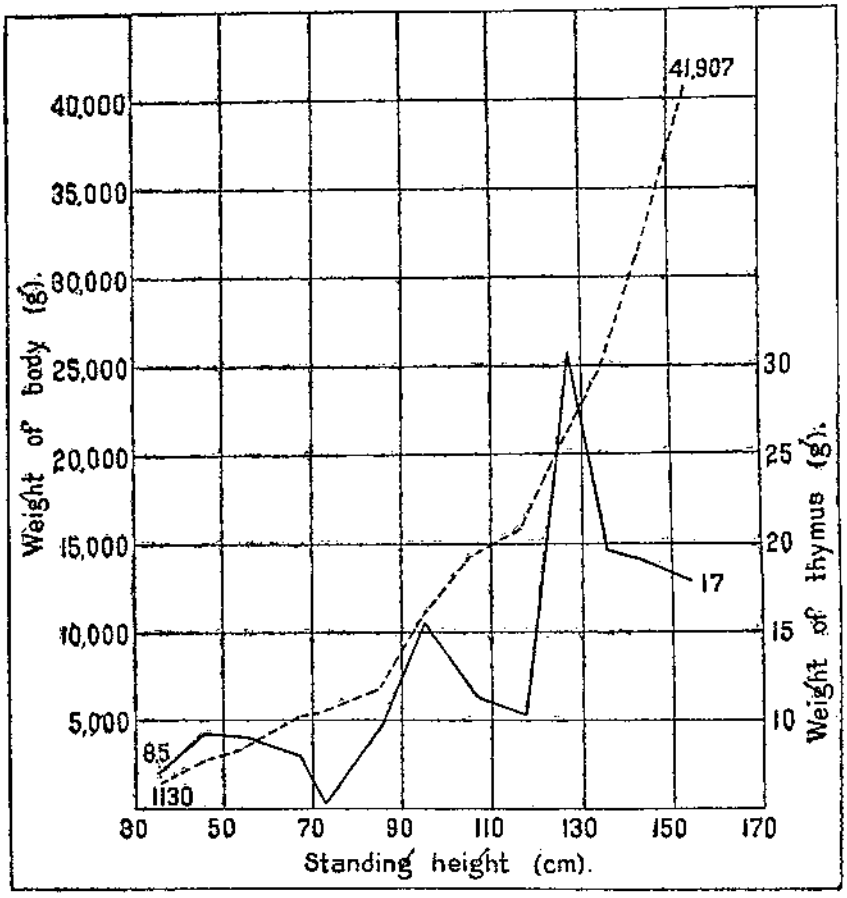

FIG. 5. Ponderal rate of growth of the body and the thymus from the time of birth to the fifteenth year of age.

VARIATIONS OF THE WEIGHT OF THE THYMUS WITH CHANGES IN BODY WEIGHT

Previously we have emphasized the finding that there exists a wide extent of variation in the ponderal state of the thymus in our series of newborns and that there is also observed, in apparent direct relation with this, a similarly wide degree of fluctuation in the body weight of our cases. To understand more clearly what direct bearing these two observations have on one another, we segregated the newborn cases into two groups of distinct body weights—one group of nonemaciated cases having body weights above 2,000 grams, and another group of poorly nourished newborns whose body weights were less than

2,000 grams. The relative standing of these two groups in their ponderal qualities are given in Tables 8 and 9. It is clearly demonstrated in these tables that in both series of newborns (series of 29 and 164) those possessing body weights of more than 2,000 grams almost invariably possess also larger and heavier thymuses than those belonging to the emaciated group. This is true not only for the mean ponderal values but also for the minimum and maximum records of weights. These two tables give for both weight and module of the thymus their minimum, mean, and maximum values, all of which invariably follow the same parallel fluctuations observed between the emaciated and nonemaciated groups.

TABLE 8.—*Average weight and module of the thymus in the nonemaciated newborns (body weight above 2,000 grams).*

Series.	Body weight.			Weight of thymus.			Module of thymus.		
	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.
Series of 29 cases (16 cases)	2,030	2,712	3,744	1.5	10.2	28.0	19.0	32.9	56.6
Series of 164 cases	2,003	2,593	3,600	3.0	16.1	45.0	18.3	35.9	51.0
Average values	2,016	2,652	3,372	2.2	13.1	36.5	18.6	34.4	51.8

TABLE 9.—*Average weight and module of the thymus in the emaciated newborns (body weight below 2,000 grams).*

Series.	Body weight.			Weight of thymus.			Module of thymus.		
	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.	Maximum.
Series of 29 cases (13 cases)	1,180	1,635	1,975	0.9	3.9	8.6	18.3	24.2	32.5
Series of 164 cases (103 cases).	577	1,418	1,994	1.0	9.5	27.0	8.3	28.0	46.6
Average values	878	1,526	1,983	1.0	6.7	17.8	13.3	26.1	39.5

The foregoing shows that whereas the mean weight and module of the thymus are, respectively, 13.1 grams and 34.4 centimeters for the nonemaciated newborns, they are 6.7 grams and 26.1 centimeters for the emaciated group. The discrepancy in the weight and dimensions between the two groups is obviously considerable. As to what actual condition of morphological differentiation and functional changes this means for the thymus, we cannot very well ascertain until further microscopical studies of the organ under varying condition of nutrition

are undertaken. Of course it may be presumed that this is due to certain varying changes in the amount of development of the stroma and probably also of the adipose tissue present in the gland. The influence of the latter, however, might be doubtful, for we have observed that in the newborn and in early childhood there is hardly any adipose tissue in the organ. Moreover, adipose tissue is known to make its appearance in the stroma of this gland rather late in childhood and its rapid increase occurs only when involution has set in, usually in the eleventh to the fifteenth year. It does not seem probable, therefore, that this would really explain the variation found in the ponderal condition of the thymus in the emaciated and nonemaciated groups.

Another explanation, which we are inclined to consider as more probable, refers directly to the question of nutrition itself. It seems to be generally admitted that the thymus plays a certain important part in the maintenance of normal nutrition during the period of growth to sexual maturity. It appears to be true also that nutrition affects the morphological and probably the functional activity of the thymus as well. It is most likely that the parallel loss or decrease in weight of the thymus in our emaciated group is due to the presence of a premature type of involution in the gland of these newborns. It is, of course, generally true that starvation in children produces acute involution of the thymus and that the condition found in our emaciated group may very likely be the result of a mild form of starvation—malnutrition—causing a correspondingly mild process of early involution, probably some degenerative changes of the parenchymatous and reticular components, expressed grossly in its reduced size and loss of weight.

Some authors have already pointed out the presence of fluctuations in the ponderal state of the thymus and that these were in the main accounted for by variations in the nutrition of the body as a whole. There is a general belief, not fully concurred in, that the thymus serves as a reserve storehouse for nutritive materials and that this reserve is called upon by the body during times of unusual need. Recent investigators have come to claim that the thymus is one of the important sources of nuclein supply of the body; that under a certain constitutional state when a high demand of nuclein is needed, as in conditions of inanition, in the period of sexual development towards the approach of maturity, or in infection, etc., this gland suffers

a varying degree of involution. Under the reverse condition, on the other hand, as in overfeeding when an increased supply of nuclein is obtained from the food, there is a correspondingly increased size or enlargement of the thymus. It has also been observed collaterally that the thymus frequently showed the result of excessive loss of weight much more rapidly than the body as a whole, and that in many exhausting diseases the loss in weight of the gland is proportionately much more than the loss in body weight. All these important points seem to strengthen the explanation tentatively offered by us to account for the existing variations in weight of the thymus in the emaciated and nonemaciated groups of our series. Many of the collateral details mentioned must be of considerable interest and importance in the study and understanding of our cases, particularly in their direct relation to the problems of the malnutrition that is generally known to exist in a large percentage of our children and young adults. It is our purpose to follow this work with a microscopic study of the thymus and we trust we can throw further light on these particular points.

COMPARATIVE STUDY ON THE THYMUS

It is of some interest to understand the comparative standing of our data with those reported from similar studies on the topography, dimensions, and weight of the thymus in other races. It is regretted that little literature of foreign workers on this subject is available locally and that we cannot present in this paper a more satisfactory comparative study of the thymus. We especially wanted to have our data compared with those of the Chinese, with which race the Filipinos have considerable blood admixture, and those of the Japanese, another Oriental race, of similar physical makeup. Records for the Chinese are yet lacking, and it appears that no study on the thymus for the newborn and adolescent of that race has been reported. Studies on the thymus for the Japanese have been made, but we failed to locate any direct reference to these in local science libraries. Data from these two neighboring Oriental races would have provided interesting points of comparison with our own findings.

The weights of the thymus in the newborn as reported by various European and American observers are given below together with our own data for the Filipinos.

Weight of the thymus in the newborns, as reported by various workers.

	g.
Amado (Spanish n. b.)	10.5
Bovaird and Nicholl	6.0
Crochet (French n. b.)	3.0 – 5.0
Figueira (Portuguese n. b.)	3.62
Holler (German n. b.)	3.0
Haugsted (German n. b.)	8.0 –12.0
Heckel and Buhl	8.42
Jackson (American n. b.)	13.0
Koelliker and Friedleben (German n. b.)	13.7
Letulle	8.5
Merkel	16.0 –20.0
Nañagas (Filipino n. b.)	9.6
Oliver (Spanish n. b.)	4.0
Sappey (English n. b.)	3.0
Testut (French n. b.)	5.0

As may be noted in this list, there is a considerable variation in the weight of the thymus among the different races of people. This ranges from 3 to 20 grams, with the majority falling between 3 and 8 grams. The weight reported for the Germans alone ranges from 3 to 13.7 grams. That for the Spaniards is from 4 to 10.5 grams, and for the French from 3 to 5 grams. The American newborns, as reported by Jackson show a weight of 13 grams for this organ. Other American observers have also reported a similar weight, which is obviously more than the average weight found for the other races. The highest reported weight for the thymus, however, is that given by Merkel, which ranges between 16 and 20 grams. It appears to us that these figures seem to indicate, in one way at least, that newborns of homogenous peoples show a lesser degree in the range of variation of the weights of the organ than newborns of heterogenous races. Of course, this point is not new, but in our opinion it needs further observation and confirmation before it can reasonably be accepted as a final and definitive conclusion.

The average weight of the thymus for the newborn Filipinos as found by us is 9.6 grams. This is to a certain extent comparatively heavier than the majority reported for the average weight found in the other races. In view of such a finding that shows the presence of a heavier thymus in Filipinos on an average, may we not presume that if the gland really exerts an important influence over body weight at birth, as is generally claimed, this function would be exerted to greater advantage in Filipino newborns; that is, if we are to judge from the relatively heavier ponderal condition of the organ in our fœtuses?

However, from our general observations and actual measurements of body weights and dimensions of Filipinos, this expected correlation between the weight of the gland and the growth of the body was not encountered. Under such circumstances we must look for some causes to explain the absence of this kind of growth correlation in Filipinos. We hold that the environmental and nurtural factors for growth in Filipinos, and the relatively unfavorable sanitary influences generally affecting the race, are still in many ways detrimental to growth. That for this organ to effect its function of influencing proper growth in our group, it may be a constitutional necessity in the body to increase, in a proportionate manner, its size and weight in response or in counter action against these many unfavorable conditions for growth still met with in the Philippines.

This functional correlation between the growth-promoting organ of the body, on the one hand, and the body constitution as a whole, in their integrative relation with the many factors of environment and nurture, on the other, may in all probability help explain the relatively heavier and larger thymus in the newborn Filipinos. In a former paper of the writer's dealing with the subject of development he had occasion to emphasize the following point of direct relevance to this question, namely:

> The findings seem to signify that the internal conditions for growth of the fetus inside the maternal womb of the Filipino mother, although probably not yet ideal, are much better than are the external factors, influences, and provisions for development after birth. Filipino infants enter the world with a much poorer condition of environment and more meager facilities for good body growth, much poorer we believe than those offered to children of other races, who, when matured, are taller and larger than the Filipinos. These conditions clearly signify that there still exist, though not to the same extent as in the past, unfavorable environmental influences and factors that seriously interfere or dangerously inhibit the full attainment of the proper adult height and dimensions in Filipinos. Although opportunities for better means of living appear to have been already initiated in the last decade, as shown by the actual improvement in the physique of the present generation, yet much remains to be studied in the way of providing those essential environmental and nurtural requisites that will effect the optimum condition of body constitution and build among the masses of our population. It has been definitely observed that our children, and even our young adults, when offered a more ideal environment and placed under more beneficial influences for the promotion of body growth and development of physique, invariably show, barring anomalous body conditions, marked increment in growth and greater range

of body reactions leading to alertness and efficiency and to the higher type of mental perception and response. Such reactions clearly evidence the presence of latent potentiality in Filipinos that has not as yet been given full freedom of expression in order to give the body its maximum growth and development. In other words, the constitutional growth and physical demands of the body in our race have not as yet been given their optimum opportunity, nurturally and environmentally, for the full attainment of dimensions and size, and our race at present is somewhat stunted physically by the many varied detrimental or unfavorable factors that affect growth and development.

With our present data we have observed that the percentage relation of the weight of the thymus to the body weight in our newborns is around 0.54 per cent. In late childhood this proportion is found to have dropped to 0.08 per cent, and at the age of adolescence it has reached 0.04 per cent of the body weight. Compared with the records from another race whose data, we regret to say are the only ones available to us for this purpose, we have found that at birth the Filipino infants possess a proportionately heavier thymus in relation to body weight than those reported by Jackson for the American newborns. Jackson's percentages for these are 0.42 for the newborns, 0.12 for late childhood, and 0.09 for adolescence. It appears then that in late childhood the Filipino children have a proportionately smaller thymus as compared with the Americans, approaching only about the same proportion found for the adolescent age of the latter, and this in spite of the fact that at birth the Filipinos have a proportionately heavier thymus in direct relation to body weight than the American newborns. Such a condition may, of course, mean the existence of a relatively more rapid rate of growth during late childhood and during adolescence in Filipinos than in Americans, or that the usual process of thymic involution might have set in earlier in our race. We must mention in this connection that the actual weight of the thymus at the age of puberty in our group is 17.8 grams, whereas that reported by Jackson for this age is 38 grams. Sabotta's figure for the age of puberty, probably taken from the Germans, is 37.5 grams, which is likewise higher than our findings.

In our opinion the points of discrepancy brought out in these findings must in one way or another carry no small significance as to the group we are dealing with now, both from the developmental and nutritional standpoints, even without considering in any further detail the relative state of body weight to stature. Very likely such a condition is closely allied, if not directly con-

nected, with the existence of certain states of nutritional disturbances or of some form of dietary insufficiency in our Filipino children. It has been noticed and reported by our local investigators for some years now, and is generally so admitted that there really exists a general condition of malnutrition among the greater mass of our people. According to Concepcion, the common diet of our people is unbalanced, being deficient in some very important food essentials. That faulty diet, through the lack of proper knowledge of preparing a balanced one, plays an important rôle in the causation of malnutrition in the Philippines. He has determined that the food essentials particularly lacking in the native diet are calcium, vitamin A, and probably vitamins B and C also. He claims that there is a marked preponderance of carbohydrates, relatively little fat, and a relatively low proportion of animal protein in relation to the total protein intake in the ordinary diet of the masses. Tupas, writing on nutrition clinics in schools, found that as high as 40.5 per cent of the school children are underweight, and from his actual observation and figures it appears that malnutrition is most prevalent among children of from 7 to 11 years, inclusive.

Our findings on the thymus as given previously appear to us to substantiate that condition that would really be met with in the body of our children and adolescents if the above-described state of malnutrition and underweight actually exists in the young group of our population. It appeals to us that it may really be possible that under such a condition of undernourishment, and under the disadvantageous influence of deficiency in vitamins, the thymus might have prematurely undergone an early process of involution. Again, that through the particular lack of vitamin B in the ordinary diet of our children and adolescents, the thymus might have really started early its usual process of involution in late childhood. Thus, it is interesting to note that the weight of this organ at this period of life, which coincides with the age of the greatest prevalence of malnutrition as found by Tupas, is proportionately lower than that found for the Americans and the Germans. Through recent studies, it is, of course, known that in cases of vitamin B deficiency the thymus is the first organ to lose weight, and it is also the organ that atrophies the most among the structures of the body that suffer a similar fate.

The possible explanation previously offered on the presence of weight discrepancy of the thymus during late childhood

between Americans and Filipinos—namely, that it might mean the existence of a relatively more rapid progress of body growth at this period of life in Filipinos—is in all probabilities incorrect, because comparative studies on growth, from measurements at this age, show precisely a contrary condition—namely, there are strong indications that body growth in various forms is more rapid with the Americans at this age of life.

On the other hand, our explanation for the presence of a larger thymus in Filipinos at birth, as compared with that of the American newborns, as being due to functional counteraction of the organ against the many unfavorable influences on nurture and environment at that age, does not seem to fit the conditions found in late childhood either, when the thymus is proportionately very much smaller. We believe that under the latter condition—that is, when the child is already born—the nurtural and environmental influences exerted on the body are no longer the same as during intrauterine life, but are much different and changed, to enable the thymus to continue to react or behave in the same manner as before birth. Thus, whereas in the former state the nurtural supply can be considered fairly complete and constant in all the essentials for body growth, the supply after birth is quite variable, particularly in late childhood when the dietary essentials are admittedly deficient and poor. Whereas, again, in the intrauterine life a uniform environment is encountered, that after birth is beset by many unfavorable external influences. Under such conditions, therefore, it is hard to imagine or to explain how the thymus could possibly react functionally in the same favorable way as before birth. On the contrary, all conditions affecting the body will overwhelmingly effect inhibition of its function and probably bring about its subsequent atrophy. In other words, there are many sufficiently unfavorable causes and detrimental factors that will help initiate and hasten the early involution in the thymus, which in fact might have actually taken place during late childhood or early adolescence in our group as indicated by our related findings. We may cite in this connection the findings of Tupas that there exists a considerable percentage of physical defects in our public-school children. His figures are as follows: Dental caries, 76.9 per cent; tonsilitis, 72.6 per cent; pharyngitis, 25.4 per cent; skin diseases, 7 per cent.

He also reports that 97 per cent of the public-school children were found to harbor intestinal parasites of one form or another, and that either trichuris or ascaris eggs or both are found in the

fæcal specimens of these children. Considering, therefore, all these many deterrent factors working together against the body growth of our children in conjunction with the nutritional and vitamin deficiencies admittedly present in the dietary of our people—facts which obviously must inhibit the normal processes of development—we cannot but suspect the close probability of the coexistence of an early involution of the thymus in Filipinos, particularly when this is corroborated by the morphological findings presented in the present work.

Referring now to the comparative standing in the topographic position of the thymus and the frequency of the various types and forms of this organ as found in our series and in the Americans, we have arranged Table 10, representing some of these conditions comparatively at birth and before and after respiration is established, to illustrate more graphically the parallelism existing between the two observations. The data for the Americans were all taken from the work of Nobach.

TABLE 10.—*Comparative condition of the thymus at birth before and after respiration is established in Americans and Filipinos.*

Condition of thymus.	Newborns with respiration not yet established.		Newborns with respiration already established.	
	Nobach.	Nañagas.	Nobach.	Nañagas.
Location:	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Thoracic			20.0	4.2
Thoracocervical		100.0		86.8
Cervicothoracic	80.0		80.0	9.0
Type:				
Unilobar	13.4			
Bilobar	57.8	85.7	75.0	36.3
Trilobar	8.8	14.3	15.0	18.1
Conglomerate	20.0		10.0	45.6
Form:				
Broad	82.3	71.4	25.0	36.3
Elongated	17.7	28.6	75.0	63.7
Relation with lungs:				
Both sides overlapped				54.5
Right side overlapped	6.6		100.0	18.1
Left side overlapped	4.4		80.0	
No overlapping		100.0		27.4

In the location of the thymus there is a close similarity between the two groups. In a great number of the cases, from 80 to 100 per cent, the organ is found either in the thoracocervical or cervicothoracic positions, and only in a few cases, 20 per cent for the Americans and 4.2 per cent for the Filipinos,

has the exclusive thoracic position of the gland been observed, and in all of these cases the respiration has been already established. In our group of newborns who have already breathed, 86 per cent had the thoracocervical thymus and only 9 per cent had the cervicothoracic location. These findings certainly indicate a strong tendency towards the thoracic position of the thymus among the newborns where respiration had been established. This may probably be explained as the result of the onset of inspiration and the continuance of respiratory movement of the thorax producing the expansion of the costal walls and the contraction or flattening of the domes of the diaphragm, which create thereby a sudden volumetric expansion of the thoracic cavity, and thus determine the pushing in or the traction, if not the suction, downward of the thymus into the anterior mediastinum. This is, in fact the most probable way we can explain the greater prevalence of the thoracic or even the thoracocervical positions of the thymus in the newborns that have had their respiration established. It is at least possible to imagine that the immediate expansion of the thoracic cavity at the onset of the first inspiration could mechanically help the descent of the thymus farther into the mediastinum.

Within the two groups compared not a single case of cervical thymus has been encountered.

As to the number of thymic lobes present in the gland, we have observed that the bilobar type is the most frequent in both the American and Filipino groups.

In the form of the thymus there exists a close coincidence in the two racial groups. The broad form is considerably more frequent in the series that have not breathed, 82.3 per cent for the Americans and 71.4 per cent for the Filipinos. The elongated form, on the other hand, is the commonest in the series that have had respiration established, 75 per cent for the former and 63.7 per cent for the latter. The explanation for this interesting finding has already been presented and discussed in a previous section of this paper (page 292). We are attributing it to the effect of mechanical pressure expansion of the lungs that bound each side of the thymus. With reference to the relation of the thymus to these organs (lungs) it has been observed that there is a partial overlapping of the lungs in one or both sides of the thymus in the majority of the series that have had respiratory function; but conversely in our group, we found not a single case of this overlapping in the newborns that have not yet breathed. This

fact has suggested to us that the presence of this overlapping of organs is to be looked upon as one of the corroborative evidences of established respiration in the autopsies of stillborn children showing such condition.

SUMMARY AND TENTATIVE CONCLUSIONS

A total of 338 cases, ranging in age from birth to adolescence, were dissected, examined, and measured for this study. Of these, 202 were males and 136 were females.

The thymus when fresh is soft and easily molds itself in the space occupied. With this natural state of consistency and through the presence of potential available space at the base of the neck, it does not appear to us possible that this organ could effect pressure obstruction or stenosis upon the surrounding structures as clinicians usually claim. On the contrary, its shape and position are invariably affected by the crowding expansion exerted by the lungs and the heart.

The elongated form of thymus is almost invariably found in the newborns that have had respiration established. The reverse, that broad thymus is frequently found in the newborns that have not yet breathed, is also true. These findings are explained by the determining influence of the pressure expansion of the lungs normally encroaching upon the thymus on both sides—the presence of this factor in the former and the absence in the latter.

There is a preponderance of the thoracocervical location of the thymus in Filipino newborns, with a frequency of 86.2 per cent. Few cases show either the cervicothoracic or the exclusive thoracic position of this organ. Not a single case of exclusive cervical position is found in the present series. In older children and in adolescents, on the other hand, the exclusive thoracic position is the one encountered with greater frequency—25 and 65 per cent of all cases, respectively. This shifting of the position of the thymus from the cervical to the thoracic region seems to have been kinetically influenced by the collateral growth processes of the elongation of the neck and the dynamic effect of the expansion of the thorax occurring most rapidly during infanthood and adolescence.

The immediate relations of the thymus vary according to the following factors: The size of the organ itself, the extent of expansion of the two lungs, and the relative inclination and size of the heart. Detailed descriptions of the immediate relations of the organ in Filipinos are given.

In the newborn series the bilobed form of the thymus is found in 48.3 per cent, the conglomerate in 34.5 per cent, and the trilobed in 17.2 per cent of all cases in the series.

The average weight of the thymus exactly at birth in the male is 8.1 grams. The maximum and minimum weights of this organ for the male newborns are 16.2 and 0.9 gram, respectively. The mean weight in the female newborns is 5.5 grams, and the maximum and minimum values are 11.3 and 0.9 gram, respectively. There is thus observed a wide extent of variation in the weight of the thymus in Filipino newborns. This finding is explained by the equally greater degree of variation existing in the general nutrition and body weight of the cases in the newborn series under study.

The weight of the thymus within a few days after birth is found to be consistently greater than at birth. This is true despite the fact that the former group generally possesses less body weight than the latter. The difference in thymic weight is from 30 to 100 per cent, whereas in the body weight it is around 200 grams. These contrasting ponderal differences are attributed to the loss of body fluid normally occurring in the first days of postnatal life and the fact that in all probability the thymus has not been at all affected by it; on the contrary it appears to have shown a rapid rate of growth or enlargement in the first two days of extrauterine life.

In children with a standing height of 100 centimeters, corresponding to about the age of 4.5 years, the weight of the thymus is already double that at birth. At a standing height of 130 centimeters, corresponding approximately to the age of 9.5 years, the weight of the organ is already four times its weight in the newborn.

We have observed that within the time of two distinct age periods of preadolescent life—one between the standing heights of 90 and 100 centimeters, with the approximate age of 4.5 years, and another between 120 and 130 centimeters, within the ages of 9 and 11 years—an abrupt increase in the weight of the thymus is distinctly noticed in each period, particularly so in the latter age interval. We have offered a tentative interpretation of these findings as actual expressions of heightened or accelerated rate of growth of the body at these periods. We attribute the rather rapid enlargement of the thymus to the existence of a collateral increase in its internal secretory function at these two important periods of life. It is, of course, generally known that the absolute weight of the thymus in-

creases quite rapidly up to the third year and is supposed to change but slightly until the seventh year, when the organ starts again increasing in weight and dimensions, which continues to the eleventh year. From this age the thymus rapidly falls in weight and size. We venture to presume that it may be that the precise age periods of rapid exacerbation of increase in size of the thymus, which normally occur in the third and the seventh year of life in the Caucasian children of temperate regions, may really take place correspondingly in the fourth and the ninth year of age in our children of Malayan stock and living in a tropical country. This interesting point naturally requires further study and verification.

It has been shown, further, that the wide extent of variations in the weight of the thymus in our series is directly correlated with the variations in body weight; that emaciated children invariably possess smaller and lighter thymuses, and that heavier ones have this organ larger and heavier also. Our tentative explanation for this is the great probability of the existence, in our emaciated group, of a degree of undernourishment that might be directly associated with a certain premature type of involution of the thymus. It is now known that this gland is the foremost organ to show early involution in cases of malnutrition and starvation, and that under such a condition the thymus sinks proportionately much more in weight than the associated ponderal loss of the whole body. This finding and tentative conclusion require further checking, both experimentally and microscopically, and if confirmed, the needed remedy should be sought for.

Our present data show that at birth Filipino infants possess a proportionately heavier thymus in relation to body weight than those reported by others for the American newborns. The parallel percentage standing of this proportion in the two racial groups is, respectively, 0.54 and 0.42 per cent for the newborns, 0.08 and 0.12 per cent for late childhood, and 0.04 and 0.09 per cent for adolescence. It is also shown in these parallel figures that in late childhood and in adolescence the Filipinos, however, have a proportionately smaller thymus than does the American group. The presence of a larger thymus in the Filipino newborns we consider due to the existence of a certain functional reaction (counteraction) of the organ against several unfavorable influences of nurture during the fœtal age in the maternal womb when the intrauterine environment is more favorable to the proper development of the body

than are the external environmental conditions after birth. The discrepancy in proportional weights seen in late childhood, on the other hand, is in our opinion closely allied, or directly dependent upon the existence of nutritional imbalance or dietary insufficiency in our children. This condition of insufficiency is now generally recognized to exist in the greater mass of our population. Really, if with the degree of undernourishment and the extent of deficiency in vitamines A and B claimed by local investigators to exist in the majority of our children, we add the aggravating condition of high incidence of intestinal parasitism in our children (97 per cent), it is not hard to imagine the seriousness of this nutritional condition which may in fact affect the thymus by hastening its premature involution in many of our children. Under such a condition, it can be imagined how much this early thymic involution can lessen the general efficiency, the vigor, the resistance to disease, and the intelligence of the young population of the race. This important problem, with its many collateral issues intimately connected with the general improvement of the race and the welfare of the people, is hardly touched upon and much less solved or remedied. This and similar questions are of the greatest importance to study and to remedy, if the race is to advance and overcome the existing handicaps to keep pace with other and more-advanced peoples. Our institutions and our Government can hardly afford to neglect or disregard such national problems urgently demanding solution.

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ILLUSTRATIONS

PLATE 1

Topographic tracing stage and tracing ocular.

TEXT FIGURES

FIG. 1. Relations and topography of the thymus in a fœtus that has not yet breathed (case 24); *a*, anterior relations; *b*, posterior relations.

2. Relations and topography of the thymus in a newborn that has had respiration established (case 22); *a*, anterior relations; *b*, posterior relations.

3. Two typical forms of elongated thymus as produced by the pressure expansion of the lungs; *a*, case 7; *b*, case 18.

4. Different forms and shapes of the thymus.
   a, Unilobar type, case 20.
   b, Bilobar type, case 9.
   c, Trilobar type, case 16.
   d, Conglomerate type, case 23.

5. Ponderal rate of growth of the body and the thymus from the time of birth to the fifteenth year of age.

PLATE 1.

PHYSIOLOGY OF REPRODUCTION IN THE RABBIT

AGE OF SEXUAL MATURITY, BREEDING SEASON, DURATION OF NORMAL PREGNANCY, AND OVULATION [1]

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INTRODUCTION

In the spring of 1924 Warwick and Gildow started an experiment to determine whether or not there is a genetic basis for the difference in susceptibility of rabbits to a particular strain of *Brucella abortus* organism, *Alkaligenes abortus* (Bang) Berge et al. The writer took up the work a year later and continued it for three years longer, thus making a total of four years' study on the experiment. During that time some data bearing on certain phases of the physiology of reproduction, such as the age at sexual maturity, the trend of litter production in different seasons, the duration of normal pregnancy, the size of the litter, and the occurrence of ovulation, were accumulated, and it seems best to publish them as a separate paper. The literature on this subject is still very limited, and although a number of investigators in Europe have reported the results of their work, our knowledge of the phenomena of reproduction in the rabbit is far from being complete.

[1] Materials used in this paper were a portion of the dissertation presented to the faculty of the Graduate School, University of Wisconsin, Madison, Wisconsin, in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Another portion of the paper was published in the Journal of Infectious Diseases 51 (July-August, 1932) 30–71, under the title, Studies on the Inheritance of Resistance and Susceptibility to Infectious Abortion. These studies were begun by B. L. Warwick and E. M. Gildow in 1924 under the joint direction of Dr. L. J. Cole, professor of genetics, and Dr. F. B. Hadley, professor of veterinary science, University of Wisconsin. The writer took up the work a year later and continued it till June, 1928.

This constitutes Paper No. 141 from the Department of Genetics of the Wisconsin Agricultural Experiment Station; it is published with the approval of the director of that station.

THE AGE OF SEXUAL MATURITY

In the journal containing breeding records of the stock of rabbits we find some data on a fairly large number of does which could be used to determine the earliest time when coitus occurs and the age at their first fertile mating. The does were placed in separate cages when about four months old. They were visited at regular hours daily and placed with the males for about five to ten minutes or until coitus had taken place. In no case was the female left in the same cage with the buck overnight. Coitus before four months was observed, by chance, on animals kept in common pens. These observations were occasional and were recorded while going our rounds. It is obvious that many other cases of coitus might have occurred at other times. These data are shown in Table 1.

TABLE 1.—*Showing the age at which female rabbits become sexually mature.*

Group A.		Group B.	
Age at first coitus.	Number of does.	Age at first fertile coitus.	Number of does.
Days.		*Days.*	
83	1	113	2
98	2	128	7
113	3	143	5
128	8	158	5
143	9	173	15
158	13	188	11
173	13	203	13
188	13	218	16
203	16	233	15
218	17	248	8
233	13	263	4
248	4	278	7
263	5	289	8
278	4	308	10
289	8	Total	126
308	3	Mean age—7.5 months.	
Total	126		
Mean age—6.5 months.			

It may be seen in Table 1 that the time of first coitus occurred between 83 and 308 days, with the mean at about 6.5 months. The first fertile mating took place between 113 and 308 days, with the mean at about 7.5 months. Under conditions that

prevail in Cambridge, England, Hammond (1925) found that young does frequently allow coitus one or two months before the first ovulation takes place. Our data indicate that a similar situation may hold true for does in Wisconsin. They also suggest that the best time to begin breeding the does is when they are about seven to eight months old.

BREEDING SEASON

It is commonly believed that under suitable conditions rabbits will breed at all times of the year. For example, rabbits kept in tropical countries may be seen to drop their young throughout the year. In temperate countries, however, this is not the case. Hammond (1925) states that in England rabbits will copulate more readily in the spring and summer months, from April to July, than they will in the autumn and winter, from September to March. Under Wisconsin conditions it appears that the period from March to July is the most favorable season for rabbits to breed. The least favorable is in summer from July to September, but rabbits will breed from September to March as may be seen in Table 2.

TABLE 2.—*Showing the frequency of litters of rabbits born in two different colonies between March, 1924, and June, 1928, and the percentages of all litters in different seasons of the year.*[a]

Colony.	Autumn.		Winter.		Spring.	
	Cases.	Per cent.	Cases.	Per cent.	Cases.	Per cent.
I (Genetics Barn)	75	33.33	47	20.89	79	31.11
II (Serum Plant)	45	24.86	50	27.62	56	30.95
Total	120	58.19	97	48.51	135	66.06
Average		29.095		24.255		33.03

Colony.	Summer.		Total.	
	Cases.	Per cent.	Cases.	Per cent.
I (Genetics Barn)	24	10.67	225	100.00
II (Serum Plant)	30	16.27	181	100.00
Total	54	27.24	406	
Average		13.62		100.00

[a] Litters born from September 23 to December 21 are included under autumn; from December 22 to March 20, under winter; from March 21 to June 20, under spring; and from June 21 to September 22, under summer.

It may be seen in the table that animals kept in the same locality but in different buildings may show slight differences in litter production. For example, the rabbits in the Genetics Barn produced a few more litters in autumn and spring while those in the Serum Plant produced more in the winter and summer. These differences were presumably due to environmental inequalities such as the construction of the buildings, ventilation, means of heating, feeding, etc.

DURATION OF NORMAL PREGNANCY

Data on the duration of normal pregnancy have been secured from a total of 283 uninoculated stock females. These rabbits were kept in separate cages and visited regularly at a definite time every day. Aborted young were not included, thus making these data of direct practical value.

TABLE 3.—*Showing the duration of normal gestation period in the rabbit.*

From copulation to birth of litter, days.	Frequency.	Percentage.	
28	1	*0.35	
29	2	*0.71	
30	35	12.37	95.4
31	134	47.35	
32	76	26.88	
33	25	8.83	
34	8	2.83	
35	2	0.71	
Total	283	100.00	

Mean	31.43 days.
P. E_m	±0.06199 day.
σ	1.56 days.
C. of V.	4.96 per cent.

* Weak undersized young which died soon after birth.

It may be noted from Table 3 that the duration of normal pregnancy varied from 28 to 35 days from the time of copulation to birth of litter, with the mean at 31.43 ± 0.062 days. Ninety-five (95.4) per cent of the 283 cases of pregnancy studied lie between 30 and 33 days, the mode being at 31 days. Nearly 50 per cent of the litters were born 31 days after insemination. These data are in agreement with those of Hammond (1925), who reported that the gestation period in 296 rabbits which he studied varied from 30 to 34 days with the mean at slightly under 32 days.

CORRELATION BETWEEN THE SIZE OF LITTER AND THE LENGTH OF GESTATION PERIOD

It is a well-known fact that, in general, in those species which bear one or two young at birth the length of the gestation period is relatively longer than in those which have several young to each litter. As there is in rabbits considerable variation in the size of litter it would seem that there might be a similar reciprocal relation to duration of pregnancy.

From the records of 220 individuals studied we find a negative correlation between the size of litter and the length of gestation period with a coefficient of -0.26 ± 0.042 as may be seen in Table 4.

The values of X and Y are:

Size of litter, X: Mean $= 6.18$; $\sigma = 1.71$.

Length of gestation period, Y: Mean $= 31.49$; $\sigma = 1.02$.

$$r = -0.2645 \pm 0.0422$$

TABLE 4.—*Showing correlation between the size of litter and the length of gestation period in days.*

Length of gestation period, Y.	Size of litter, X.												
	1	2	3	4	5	6	7	8	9	10	11	12	
Days.													
28							1						1
29													0
30				3	3	5	6	5	2				24
31		2	2	2	20	25	29	13	7	3			103
32			3	7	15	17	8	12				1	61
33			5	2	5	1	4	3		1			21
34	1			1	2		3	1					8
35	1		1										2
Total	2	2	11	15	45	48	49	34	9	4		1	220

It is seen in Table 4 that the correlation coefficient is slightly over six times its probable error. While the correlation is small, indications are that there is a reciprocal negative relation between the size of the litter and the length of the gestation period in the rabbit; namely, the smaller litters tend to be carried longer than the larger ones. Other factors are probably concerned; such as, inherited characteristics of certain does for prolonged or shortened gestation periods; age of the animals, it being known that in sows, for example, the gilts have relatively shorter gestation periods than old sows; size of individuals in the litter, nutrition; and seasonal variations.

OVULATION AFTER PARTURITION

Our interest in the question of ovulation after parturition lies in the consideration of the fact that if spontaneous ovulation without coitus does take place in the rabbit after parturition, a relatively larger number of females could be artificially inseminated at one time with spermatozoa from a single male. Those who have worked on this subject are at variance as to whether or not ovulation occurs after parturition without the necessary stimulus incident to coitus. Weil (1873) cited Bischoff to the effect that copulation has nothing whatever to do with ovulation other than to hasten the process, and Ivanoff (1900) claims to have induced fertility by artificial insemination without coition after parturition. Hammond (1925), on the other hand, has presented indirect evidence to show that spontaneous rupture of the Graafian follicles does not occur without coitus. He mated does at varying intervals after parturition to bucks of known fertility. Of the twenty-five does so mated from the first to the thirty-sixth day after parturition, twenty allowed coitus and nineteen became pregnant. This was taken as conclusive evidence to show spontaneous ovulation had not occurred, for otherwise these matings would have been infertile owing to the formation of corpora lutea of pseudopregnancy.

Evidence directly confirming the data of Hammond have accumulated in the course of our work, from observation on the does which were subjected to post-mortem examination for other purposes after parturition. In some of these does the presence or absence of newly ruptured follicles was incidentally recorded. The results are given in Table 5.

All the sixteen does listed in Table 5 were kept in separate cages and had had no direct contact with the males or any other females from the time they littered to the day when examinations were made. There had been no possibility of occasional ovulation which according to Hammond (1930) may be stimulated by the excitement produced by two females jumping on one another. Seven of the sixteen produced normal litters; the remaining aborted their young. It may be seen that none of the sixteen showed newly ruptured follicles. Newly ruptured follicles are easily recognized as bright red protrusions on the surface of the ovary and can thus be easily differentiated from the mature follicles, which are rounded protruding bodies filled with clear pink or amber fluid.

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TABLE 5.—*Showing the number of ripe follicles found at post-mortem examination of does that had not been mated to males after parturition.*

[Ab, aborted litter; Nr, normal litter.]

Doe No.—	Nature of parturition.	Post-mortem examination made after parturition (days).														Recently ruptured follicles.		Ripe follicles.	
		1.25	1.5	1.75	2	3	4	5	6	10	15	20	25	30	35	Right.	Left.	Right.	Left.
175A1	Ab	×														0	0	3	3
47D3	Nr		×													0	0	5	6
185A23	Nr		×													0	0	3	3
17D2	Ab			×												0	0	8	4
194A2	Nr				×											0	0	5	4
215A2	Ab				×											0	0	5	4
48D2	Ab					×										0	0	7	6
60A1	Ab						×									0	0	4	3
171A13	Ab							×								0	0	4	7
38A2	Nr								×							0	0	5	7
215A3	Nr								×							0	0	6	7
10D2	Ab										×					0	0	(a)	(a)
180A4	Nr											×				0	0	0	0
11D8	Nr													×		0	0	3	4
173A3	Ab														×	0	0	(a)	(a)
207A1	Ab														×	0	0	0	0

[a] Follicles filled with clear colorless fluid.

SUMMARY

The following summary may be drawn from the foregoing discussion.

1. The age at which female rabbits become sexually mature is from 113 to 303 days, the average being seven and a half months, but they may accept the males about a month earlier.

2. The duration of normal pregnancy is from 30 to 33 days.

3. When placed under suitable environment they continue to produce litters throughout the entire year, but in Wisconsin the highest litter production is secured in the spring and the lowest in summer months.

4. A small but significant negative correlation ($r = -0.26 \pm 0.042$) between the size of litter and the duration of pregnancy was found, indicating the existence of a reciprocal relationship.

5. Spontaneous ovulation after parturition does not occur in the rabbit. The stimulus of coitus appears to be necessary for its occurrence.

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DIE PHILIPPINISCHEN ARTEN DER UNTERGATTUNG CALLIRRHIPIS (COLEOPTERA)

ZUR KENNTNIS DER SANDALIDÆ 19; ZUGLEICH PHILIPPINISCHE SANDALIDÆ 2

Von FRITZ VAN EMDEN

Dresden (Nr. 58), Deutschland

Dieser zweiter Teil der Bearbeitung der philippinischen Sandalidæ umfasst die Untergattung *Callirrhipis* s. str.[1] Es sind die grossäugigen Callirrhipini ohne zehn regelmässige Punktstreifen, mit im männlichen Geschlecht langen Fühlerlamellen und kurzen Fühlergliedern sowie spärlicher bis wenig dichter Hauptpunktierung der Flügeldecken oder seltener dichter Hauptpunktierung, dann aber mit nur schwach entwickelten Rippen. Bekannt waren bisher von den Philippinen—abgesehen von den inzwischen aus *Callirrhipis* ausgeschiedenen *Simianellus*-Arten— fünf Arten dieser Untergattung, von denen allerdings *viracensis* W. Schultze (1918) mit *antiqua* Waterhouse (1877) artgleich ist, während dafür *antiqua* W. Schultze (1915, nec Waterhouse) neu benannt werden muss. Hierzu kommt die von Waterhouse (1877) aus Borneo beschriebene, inzwischen von Prof. Baker auch auf Palawan (Puerto Princesa) gefundene *C. lineata* und neun neue Arten und Rassen, sodass die Zahl der philippinischen *Callirrhipis* s. str. mit vorliegender Arbeit auf fünfzehn erhöht wird.

Dank schulde ich Herrn W. Schultze, Bad Tölz, für das Leihen seiner Typen, dem verstorbenen Prof. C. F. Baker, Los Baños, beziehungsweise dem United States National Museum, Baker Collection, für das Leihen seines Materiales, sowie Herrn Prof. Dr. H. Wachs, Herrn Dr. A. Kästner und dem verstorbenen Herrn Rektor G. Schröder, sämtlich in Stettin, für das Leihen der Sandalidæ des Stettiner Naturkundemuseums.

Nomenklatorische Ergebnisse: *C. viracensis* W. Schultze (1918) wird synonym zu *antiqua* Waterhouse (1877); neu beschrieben werden *sandaloides* (= *antiqua* Schultze, 1915, nec

[1] Siehe Ent. Blätt. 27 (1931) 51.

Waterhouse), *luzonica* und *rugicollis* von Luzon, *acutipennis* von Mindanao, *longitarsis* und *schultzei* von Panay, *grisea* von Mindoro, *bakeri* von Samar, *parallela* von Negros und *helleri meridionalis* von Mindanao und Samar.

Bestimmungstabelle der Arten der Untergattung Callirrhipis.

1 (20) Behaarung der Flügeldecken beim Männchen verschieden gelagert, die Decken dadurch fast immer gescheckt erscheinend. Der vor dem Fühlerhöcker gelegene Teil der Stirn auch in der Mitte stets stark von ihm abgesetzt, in der Horizontalebene des Kopfes plattenförmig vorgezogen und die Oberlippe samt Clypeus überdeckend, der Vorderrand höchstens in der Mitte leicht ausgerandet. Ovipositor des Weibchens ohne stumpfe Seitenecke. Die Flügeldeckenrippen verhältnismassig kräftig, die 1. mündet nach aussen biegend in die 2., diese vereinigt sich, ebenfalls etwas nach aussen biegend, mit der 4., nachdem letztere kurz vorher die flache 3. Rippe aufgenommen hat. Die Flügeldecken vor der Vereinigung der 1. und 2. und noch mehr vor der der 2. und 4. konkav gewölbt ..... *C. dissimilis*-Gruppe.

3 (3) Flügeldecken des Männchens nicht gescheckt. Körper, besonders beim Weibchen sehr robust (3–3, zweimal so lang wie an den Schultern breit) und das Weibchen im Habitus an *Sandalus* erinnernd. LUZON, Benguet, Baguio; Nueva Viscaya, Imugan.
C. sandaloides sp. nov.

3 (2) Flügeldecken des Männchens gescheckt. Körper schlanker, beim Weibchen 3.4 mal so lang wie an den Schultern breit oder länger.

4 (7) Halsschildseitenrand mit sehr starkem, breitem Seitenrandeindruck, sodass die Kontur breit und tief ausgerandet erscheint. Fühler fast oder reichlich von Körperlänge.

5 (6) Flügeldecken am Ende am Aussenrande gerade zugespitzt. Erstes Tarsenglied etwas länger als die beiden folgenden zusammen, Halsschild hinter dem Vorderrand etwas breiter als an den Seitenrandeindrücken. MINDANAO..... *C. acutipennis* sp. nov.

6 (5) Flügeldecken am Ende des Aussenrandes deutlich flach gerundet. Halsschild an den Seitenrandeindrücken breiter als hinter dem Vorderrand; also von der Spitze bis zur Basis dauernd wenn auch ungleichmässig an Breite zunehmend. LUZON.
C. lagunæ Schultze (1916).

7 (4) Halsschildseitenrand mit meist deutlichem, doch wenig grossem Seitenrandeindruck, die Kontur also höchstens flach ausgerandet erscheinend.

8 (11) Fühler des Männchens lang (drei Viertel körperlang bis körperlang), Tarsen schlanker.

9 (10) Halsschild nach vorn stark verengt, zwischen den Vorderecken der Kontur halb so breit wie an der Basis, mit tiefen, grossen Discoidaleindrücken. Marmorierung der Flügeldecken beim Männchen sehr auffällig, Rippen sehr kräftig. Schildchen hinten breit abgerundet-abgestutzt. PANAY ..... *C. schultzei* sp. nov.

10 (9) Halsschild nach vorn mässig stark verengt, zwischen den Vorderecken der Kontur zwei Dritteln so breit wie an der Basis, mit wenig tiefen, kleinen Discoidaleindrücken. Marmorierung der Flügeldecken wenig auffällig, Rippen mässig kräftig. PANAY. *C. longitarsis* sp. nov.

11 (8) Fühler des Männchens bis reichlich zwei Dritteln so lang wie der Körper. Tarsen normal, das 1. Glied kürzer als 2. + 3., 2. bis 4. höher als lang, Klauenglied deutlich erweitert.

12 (13) Schildchen breiter als lang, hinter der Mitte am breitesten, der Hinterrand breit abgerundet. Körper schwarzgrau gefärbt. Scheckung unauffällig. Die Zwischenräume der Halsschildpunktierung nirgends stärker erhaben, daher nicht stellenweise runzlig oder ölig erscheinend. MINDORO..... *C. grisea* sp. nov.

13 (12) Schildchen länger als breit oder breiter als lang, dann aber deutlich vor der Mitte am breitesten und hinten abgerundet-zugespitzt. Körper braun gefärbt. Scheckung auffälliger. Die Zwischenräume der Halsschildpunktierung stellenweise stärker erhaben und runzlig oder ölig-zusammengeflossen erscheinend.

14 (15) Fühler reichlich zwei Dritteln so lang wie der Körper. Jederseits vor und ausserhalb der Discoidaleindrücke noch ein kleiner, rundlicher, ziemlich tiefer, dem Discoidaleindruck ähnlicher, Eindruck. Obwohl dieser beiderseits vorhanden ist, handelt es sich möglicherweise um eine Monstrosität. Präscutellareindrücke sehr gross und kaum weniger tief als die Discoidaleindrücke. Flügeldecken der Länge nach ziemlich stark gewölbt mit ausserordentlich stark erhabenen, breiten Rippen. SAMAR. *C. bakeri* sp. nov.

15 (14) Fühler bis zwei Dritteln so lang wie der Körper. Halsschild jederseits mit nur einem Discoidaleindruck. Präscutellareindrücke kaum grösser, wenn auch weniger deutlich begrenzt, und viel flacher als die Discoidaleindrücke. Flügeldecken der Länge nach schwach gewölbt mit mässig entwickelten Rippen.

16 (17) Die 1. und 2. Rippe in der Basalhälfte der Flügeldecken äusserst schwach erhaben, die Zwischenräume zwischen den Rippen demgemäss in der Basalhälfte unmerklich, in der Apikalhälfte schwach konkav. Flügeldecken sehr schlank und auffällig parallel. Hauptpunktierung der Flügeldecken ziemlich fein und wenig dicht. NEGROS ..... *C. parallela* sp. nov.

17 (16) Die 1. und 2. Rippe in der Basalhälfte der Flügeldecken deutlich erhaben, die Zwischenräume zwischen den Rippen deutlicher konkav, Zum Teil auch in der Basalhälfte. Flügeldecken weniger schlank und weniger parallel, Hauptpunktierung viel gröber und dichter.

18 (19) Die Zwischenräume der Halsschildpunktierung nur jederseits ausserhalb der Hinterecken etwas runzlig verliessend, vorn auf der Scheibe nur wenig merklicher erhaben als bei *grisea*. Die Rippen der Flügeldecken breit und stark erhaben und allmählich in die konkaven Zwischenräume übergehend, jederseits durch eine wenig regelmässige Punktreihe begrenzt. Hauptpunktierung

wenig grob und mässig dicht. Flügeldecken wenig stark zugespitzt. Färbung dunkel rotbraun. LUZON, Tayabas, Malinao.
C. luzonica sp. nov.

19 (18) Die Zwischenräume der Halsschildpunktierung überall stark öligzusammenfliessend. Die Rippen der Flügeldecken wenig breit und wenig stark erhaben, doch jederseits durch eine ziemlich regelmässige Punktreihe sehr scharf von den schwach konkaven Zwischenräumen abgesetzt, Hauptpunktierung grob und dicht. Flügeldecken stärker zugespitzt. Färbung heller rotbraun, Scheckung feiner. LUZON ..... *C. rugicollis* sp. nov.

20 (1) Behaarung der Flügeldecken beim Männchen fast einheitlich nach hinten gerichtet oder mehr oder weniger geschwunden. Der vor dem Fühlerhöcker gelegene Teil der Stirn fällt beim Weibchen—soweit bekannt—stets, beim Männchen meistens in der Mittellinie kurz und schräg zum Vorderrand ab, nur die Vorderecken springen stärker vor, sodass der Vorderrand breit bogenförmig ausgeschnitten erscheint und Oberlippe und Clypeus im Ausschnitt sichtbar werden.

21 (26) Körper rotbraun bis pechbraun. Die Rippen der Flügeldecken beim Männchen auch an der Basis nicht auffällig dichter behaart als die Zwischenräume, Rippen und Zwischenräume beim Männchen nie kahl. Ovipositor des Weibchens mit stumpfer Seitenecke. Mittlere Arten.

22 (25) Punktierung des Halsschildes und Hauptpunktierung der Flügeldecken fein. Der vor dem Fühlerhöcker gelegene Teil der Stirn beim Männchen plattenförmig vorgezogen (beim Weibchen kurz abfallend und bogenförmig ausgeschnitten). Die Präscutellareindrücke flach und undeutlich, Discoidaleindrücke auch hinten aussen gut begrenzt. Halsschild ziemlich lang, vorn breiter und die Seiten ziemlich geradlinig. Fühler des Männchens mittellang bis lang.

23 (24) Die Rippen fast völlig verflacht, besonders auch hinter der Vereinigung der 1. und 2., die sie begleitenden Punkte nicht dichter und gröber als die der Zwischenräume. Körper etwas schlanker. LUZON ..... *C. helleri* Schultze (1915).

24 (23) Die Rippen etwas erhaben, besonders hinter der Vereinigung der 1. und 2., die sie begleitenden Punkte etwas dichter und gröber als die der Zwischenräume. MINDANAO. SAMAR.
C. helleri meridionalis subsp. nov.

25 (22) Punktierung des Halsschildes und Hauptpunktierung der Flügeldecken grob. Der vor dem Fühlerhöcker gelegene Teil der Stirn in beiden Geschlechtern kurz abfallend und bogenförmig ausgeschnitten. Die Präscutellareindrücke ziemlich tief und sehr deutlich, Discoidaleindrücke hinten aussen mit den Hintereckeneindrücken verfliessend. Halsschild kurz, kreisbogenförmig, nach vorn mehr gerundet und stärker verengt. Fühler des Männchens wenig lang. LUZON bis MINDANAO.
C. antiqua Waterhouse (1877).

26 (21) Körper rostrot bis bräunlichrot. Die Rippen der Flügeldecken beim Männchen wenigstens an der Basis dichter behaart als die Zwischenräume. Bei den philippinischen Arten fällt der vor dem Fühlerhöcker befindliche Teil der Stirn kurz und steil ab und ist vorn breit und tief ausgerandet. Kleine Arten.

27 (28) Behaarung und Grundpunktierung der Flügeldecken beim Männchen auch in den Zwischenräumen der Rippen stark entwickelt, nur der Schildchenstreif und manchmal die Basis der 1. Rippe dichter behaart. Halsschild dicht punktiert, sodass die meisten Punkte um weniger als ihren Durchmesser voneinander entfernt sind, der Länge nach nur sehr flach gewölbt, die Vorderecken sehr breit abgerundent und nur schwache Augenlappen bildend. Weibchen unbekannt. Männchen 9.5 bis 11.3 mm. LUZON. MINDANAO. SALAWATI. BATJAN.

C. tiaongona Schultze (1915).

28 (27) Behaarung und Grundpunktierung der Flügeldecken beim Männchen fast ausschliesslich auf den Rippen entwickelt, auch die Naht und öfters mehr oder weniger die äusseren Rippen behaart. Halsschild wenig dicht punktiert, sodass die meisten Punkte um mehr als ihren Durchmesser voneinander entfernt sind, der Länge nach ziemlich flach gewölbt, die Vorderecken mässig breit abgerundet und kräftige Augenlappen bildend. Weibchen bis auf die Behaarung und Grundpunktierung der Flügeldecken wie das Männchen. Halsschild mit unregelmässiger, grösstenteils etwas feinerer, wenig dichter Punktierung. Männchen 9.5 bis 11.5, Weibchen 16.5 mm. PALAWAN. BORNEO. SUMATRA.

C. lineata Waterhouse (1877).

CALLIRRHIPIS SANDALOIDES sp. nov.

Fünf Männchen, 4 Weibchen, LUZON, Benguet, Baguio (Männchen und Weibchen, *Baker*, United States National Museum); 2 Männchen, 2 Weibchen (*Böttcher*, Mus. Dresden); Männchen und Weibchen ebenda 1,600 m. (Samml. W. Schultze, davon das Männchen jetzt in Mus. Dresden); Männchen (Samml. W. Schultze); 1 Männchen N. W. LUZON (Mus. Stettin); 1 Männchen LUZON, Nueva Vizcaya, Imugan, *Baker* (Mus. Dresden), insgesamt liegen also 7 Männchen und 4 Weibchen vor. Ferner besitzt des Städtische Museum für Natur-, Völker- und Handelskunde, Bremen, 3 Männchen, davon 2 von Santo Tomas, 1 von Haight's, alle von O. Schütze gesammelt. Beide Orte liegen in Benguet.

Männchen.—Körper dunkel kastanienbraun; Fühler, Beine und Flügeldecken kastanienbraun. Behaarung sehr fein, ziemlich lang und ganz anliegend, wechselnd gelagert, vor allem von den Zwischenräumen nach den Rippen und etwas nach hinten gerichtet, sodass die auf den Rippen von beiden Seiten zusam-

menstossenden Haare und die auf ihnen stehenden die Rippen besonders betonen und die Haare grossenteils zueinander in Form eines breiten V angeordnet sind. Kopf ziemlich fein und sehr dicht punktiert. Drittes Glied der Kiefertaster ein Sechstel kürzer als das 2. Anderthalbmal so lang wie breit, das 4. ein und ein Drittel so lang, knapp zweimal so lang wie breit, zur Spitze stark zugerundet. Fühler halb bis drei Fünfteln (0.52 + 0.57 mal) so lang wie der Körper, schon das 3. Glied deutlich länger als breit. Halsschild mässig kurz, zur Spitze stark verengt und kräftig gerundet, die Seiten konvex gerundet, der Seitenrandeindruck fast stets sehr seicht, die Kontur durch ihn fast nie ausgerandet; unmittelbar von den Hinterecken sind die Seiten äusserst kurz aber meist sehr deutlich etwas ausgerandet. Die herabgeschlagenen Vorderecken etwas gerundet vorgezogen, selbst bei monokularer Betrachtung von oben beiderseits etwas sichtbar. Halsschildpunktierung fein und mässig dicht, zur Basis sehr fein werdend, die Zwischenräume nicht ölig verfliessend. Discoidaleindrücke ziemlich tief, ringsum scharf gegrenzt, Präscutellareindruck einfach, fast völlig erloschen, Hintereckeneindrücke ausserordentlich flach. Halsschild sehr flach und sehr gleichmässig gewölbt. Schultern ziemlich viel breiter als die Halsschildbasis, stark gerundet. Flügeldecken von den Schultern an kaum merklich verengt, vom Anfang des letzten Drittels an stärker gerundet-verengt, etwas abgerundet-zugespitzt. Rippen breit und stark erhaben, doch die eigentliche Rippen völlig unscharf in die Zwischenräume übergehend, die 3. Rippen deutlicher als bei anderen Arten, die gemeinsame Verlängerung der Rippen ist wenig deutlich und erreicht mehr oder weniger erkennbar Naht oder Seitenrand kurz vor der Spitze. Hauptpunktierung äusserst fein und spärlich, zwischen der verhältnismässig sehr groben, wenig dichten Grundpunktierung wenig auffallend. Die Flügeldecken kaum stellenweise mit angedeuteter Knitterung. Flügeldecken in den basalen zwei Fünfteln ziemlich kräftig gewölbt, im übrigen fast eben und nur zur Spitze selbst wieder etwas gewölbt abfallend, der Breite nach ziemlich kräftig gewölbt. Schienen und Tarsen mässig schlank, das 2. und 3. Glied der Vorder- und Mitteltarsen nur wenig höher als lang. Länge 13.3 bis 15.8 mm. Schulterbreite 4.1 bis 5.0, Fühlerlänge 7.0–9.0.
mm, Schulterbreite 4.1 bis 5, Fühlerlänge 7 bis 9.

Weibchen.—Pechbraun bis pechschwarz. Durch die stark entwickelten Flügeldeckenrippen, den (wie beim Männchen)

plattenförmig vorgezogenen Vorderteil der Stirn und das Fehlen einer stumpfen Seitenecke des Ovipositors mit den anderen Weibchen der *dissimilis*-Gruppe übereinstimmend, jedoch von allen bekannten *Callirrhipis* Weibchen durch die viel kürzere und robustere, an *Sandalus* erinnernde Gestalt, auffällig verschieden. Kopf wenig dicht und mässig fein punktiert. Fühler sehr kurz, von etwa ein Fünftel der Körperlänge, das 4. bis 10. Glied breiter als lang, das 11. eiförmig bis länglich eiförmig, die Lamellen des 3. bis 10. an Länge wenig verschieden, weniger als dreimal so lang, das 3. nur ebenso lang wie das zugehörige Glied. Halsschild vorn sehr breit gerundet, dem des Männchens ähnlich, doch etwas gewölbter und zwischen der ziemlich feinen und wenig dichten Grundpunktierung nach den Seiten und der Spitze zu mit eingestreuten gröberen Punkten, die Punktierung auf der Scheibe mehr oder weniger erlöschend. Präscutellareindruck erloschen oder fast erloschen. Discoidaleindrücke klein und wenig tief, doch scharf begrenzt. Schildchen nur mit einigen feinen, zerstreuten Punkten. Flügeldecken bis zum Ende des zweiten Drittels ziemlich stark erweitert, dann kräftig gerundet-verengt, an der Spitze breit abgerundet. Rippen sehr breit und stark erhaben, sie verlaufen wie in dieser Gruppe allgemein, die gemeinsame Verlängerung zieht wenig erhaben, doch deutlich bald zum Aussenrand, bald zum Seitenrand. Grundpunktierung ziemlich grob; sehr zerstreut und in der Basalhälfte fast völlig erloschen, die Rippen infolgedessen ziemlich stark glänzend, ebenso der Halsschild. Die Zwischenräume erscheinen dem unbewaffneten Auge demgegenüber infolge der ziemlich feinen und wenig dichten Hauptpunktierung ziemlich matt. Schienen und Tarsen wenig schlank, das 2. bis 4. Glied der Tarsen viel höher als lang. Länge 16.8 bis 20.2 mm, Schulterbreite 5.5 bis 6.7.

Durch die kurze Körperform, besonders des Weibchens, und die nicht gescheckte sondern breit V-förmig gelagerte Flügeldeckenbehaarung des Männchens ist diese mit den Merkmalen der *dissimilis*-Gruppe ausgestattete Art von allen anderen *Callirrhipis*-Arten leicht zu unterscheiden und ausserordentlich auffällig. Auf diese Art beziehen sich W. Schultzes Angaben, Philip. Journ. Sci. § D 10 (1915) 273, über *C. antiqua* wie die Bemerkungen über Flügeldeckenrippen und Flügeldeckenbehaarung deutlich erkennen lassen. Zu *C. sandaloides* ist also synonym *C. antiqua* Schultze (1915, nec Waterhouse, 1877).

CALLIRRHIPIS ACUTIPENNIS sp. nov.

Männchen.—MINDANAO, Zamboanga (Ort Zamboanga), Samml. W. Schultze. Dunkel kastanienbraun, die Flügeldeckennaht in den letzten zwei Dritteln, Bauch, Schienen und Tarsen etwas heller rotbraun; die Fühler hell rotbraun, graugelb bis goldgelb fein anliegend behaart. Das Schildchen, ein etwa halbkreisförmiger hinter der Schulter beginnender, nach innen bis an die erste Rippe, nach hinten bis fast ans Ende des dritten Fünftels reichender Fleck am Seitenrand sowie je ein kleinerer, mit dem Seitenrand unregelmässig zusammenhängender Fleck zwischen der zweiten und vierten Rippe vor deren Vereinigung und zwischen der Fortsetzung dieser Rippen und der Naht, endlich ein sehr kleines Fleckchen vor der Spitze neben der Naht durch aufrechte dunkelbraune Behaarung und etwas dunklere Grundfarbe der Flügeldecken dunkelbraun erscheinend. Die Flügeldecken im übrigen durch anliegende graugelbe und halbanliegende hellbraune Behaarung in helleren Tönen spielend. Kopf grob, tief und unregelmassig punktiert. Zweites und drittes Kiefertasterglied gleich lang, etwa anderthalb so lang wie dick, das letzte etwa anderthalb so lang wie jedes der beiden vorhergehenden, drittehalb so lang wie breit. Fühler kaum merklich länger als der Körper, die Glieder äusserst kurz und breit, erst das 10. deutlich länger als breit. Halsschild sehr breit und kurz, der Vorderrand der Kontur jederseits der Mitte etwas ausgerandet, die Vorderecken der Kontur stark gerundet vorspringend und nach hinten in den äusserst stark entwickelten Seitenrandeindruck übergehend, in dem der Halsschild seine schmalste Stelle erreicht. Die Seiten dann geradlinig erweitert und schliesslich auf der Mitte zwischen Seitenrandeindruck und Basis stumpfwinklig in den fast parallelen, nur unmerklich erweiterten Basalteil übergehend. Die herabgeschlagenen eigentlichen Vorderecken als flache, breite Augenlappen entwickelt. Halsschildpunktierung in den Eindrücken spärlich, im übrigen dicht und fein, die Zwischenräume der Punktierung zum Teil etwas runzlig verfliessend, vor und ausserhalb der Discoidaleindrücke werden diese Runzeln an zwei bis drei Stellen geradezu zu queren bis schrägen Fältchen. Die Discoidaleindrücke breit mit den verhältnismassig tiefen Hintereckeneindrücken verfliessend, innerhalb dieses grossen Eindruckes jedoch nur als kleines, wenig tiefes Grübchen schärfer begrenzt. Halsschild zum Vorderrand kräftig abfallend, im übrigen fast ohne Längswölbung. Schultern wenig breiter als die Halsschildbasis, sehr flach gerundet. Die Flügeldecken bis zur Mitte geradlinig sehr schwach

erweitert, im dritten Viertel leicht gerundet-verengt, im grössten Teil dez letzten Viertels völlig geradlinig zugespitzt und nur die äusserste Spitze wieder abgerundet. Die 1., 2. und 4. Rippe, abgesehen von der Basis sehr stark erhaben, die 1. vor der Einmündung in die 2. verflacht, diese mündet weiter apicalwärts in die 4., und die Vereinigung aller Rippen mündet vor der Spitze, sich verflachend, in den Aussenrand. Hauptpunktierung der Flügeldecken grob und dicht, Grundpunktierung fein, mässig dicht, wenig tief und etwas runzlig. Flügeldecken hinter der Basis stark gewölbt, in der Spitzenhälfte ganz geradlinig abfallend. Schienen und Tarsen schlank, das 2. bis 4. Tarsenglied höher als lang, das 1. etwas länger als das 2. und 3. zusammen, das Klauenglied im Basaldrittel nicht dicker als die vorhergehenden Glieder. Länge 21 mm, Breite der Schultern 5.7, fühlerlänge 21.3.

Die vorgezogene Stirn, die Marmorierung und Rippen der Flügeldecken und die allgemeine Körperform stimmen mit der *dissimilis*-Gruppe überein, doch unterscheidet der starke Seitenrandeindruck, in dem der Halsschild schmaler ist als hinter den Vorderecken, die Art leicht auch von *constricticollis* Emden (1926) und *lagunæ*, denen sie im übrigen am nächsten steht. Auch die geradlinige Zuspitzung der Flügeldecken macht sie leicht kenntlich, in diesem Merkmal kommt ihr am ehesten die viel robustere *C. templetoni* Westwood (= *fasciata* Waterhouse) nahe, die im männlichen Geschlecht durch die Bürste auf dem zwei und drei freien Abdominalsternit von *acutipennis* und allen anderen Arten ganz abweicht.

CALLIRRHIPIS LAGUNÆ Schultze (1916).

Männchen.—Typus: LUZON, Laguna, Paete, Samml. Schultze. Kastanienbraun, die Beine rotbraun, die Tarsen heller braunrot. Pronotum sehr dicht und ziemlich lang, ganz anliegend seidig behaart. Marmorierung der Flügeldecken ziemlich dicht und wurmförmig verschlungen, ein grosses Dreieck an der Basis und ein schräger von vorn innen nach hinten aussen gerichteter Fleck etwa in der Mitte jeder Flügeldecke nicht deutlich gescheckt. Stirn und Scheitel mässig fein, erstere wenig dicht, letzterer dicht punktiert. Das 3. Kiefertasterglied eine Kleinigkeit kürzer und dünner als das 2., reichlich anderthalb so lang wie breit, das 4. etwa ein und zwei Dritteln so lang wie das 3. fast dreimal so lang wie dick. Fühler von Körperlänge, bereits ihr 5. Glied deutlich länger als breit. Halsschild kurz und breit, der Vorderrand der Kontur jederseits der Mitte seicht ausge-

randet, die Vorderecken der Kontur wenig abgerundet, fast stumpfwinklig nach hinten zum Seitenrandeindruck umbiegend. Dieser äusserst breit und sehr tief, jedoch am Grunde etwas weiter von dem der Gegenseite getrennt als die Vorderecken der Kontur. Vom Ende der durch den Seitenrandeindruck bedingten Ausrandung ab ist der Halsschild zur Basis geradlinig erweitert. Die herabgeschlagenen eigentlichen Vorderecken als flache, breite Augenlappen entwickelt. Halsschildpunktierung vorn äusserst fein und äusserst dicht, in der Basalhälfte etwas weniger fein und weniger dicht, in den Discoidaleindrücken zerstreut punktiert. Die Zwischenräume der Punktierung nicht runzelig bis ölig verfliessend. Die Discoidaleindrücke innen ziemlich kräftig eingedrückt, aussen breit mit den Seitenrand und Hintereckeneindrücken verfliessend. Die Präscutellareindrücke beim Typus tief und verschmolzen, mit vertiefter Mittellinie. Halsschild zur Spitze mässig gewölbt, in der Basalhälfte flach. Schultern wenig breiter als die Halsschildbasis, sehr flach gerundet. Flügeldecken bis fast ans Ende des dritten Fünftels fast parallel, von da bis zur Spitze in sehr flachem Bogen gerundet-verengt, die Spitze selbst etwas breiter abgerundet. Die Rippen der Flügeldecken, abgesehen von der Basis, breit und vor der Vereinigung ziemlich stark erhaben, doch wenig scharf abgesetzt. Die Forstsetzung der vereinigten Rippen endet etwa ein Siebentel del Flügeldeckenlänge vor der Spitze frei. Hauptpunktierung der Flügeldecken sehr fein und mässig dicht, Grundpunktierung fein, sehr dicht und tief. Flügeldeckenbasis mässig gewölbt, die zwei apikalen Drittel ohne Längswölbung, nur zur Spitze selbst ganz kurz geneigt. Schienen und Tarsen sehr schlank, das 2. bis 4. Tarsenglied höher als lang, nur an den Vordertarsen das 2. so lang wie hoch, das 1. Glied an den Vordertarsen etwas länger, an den Mittel und Hintertarsen so lang wie oder etwas kürzer als die beiden folgenden zusammen (in der Mitte der Seite gemessen), das Klauenglied der Vorder- und Mittelbeine in der Basalhälfte nicht dicker als die vorhergehenden Glieder. Länge des Typus 16 mm, Schulterbreite 4.3, Fühlerlänge 16.

Etwas kleinere, auffällig schlanke Art der *dissimilis*-Gruppe, noch schlanker als *constricticollis* Emden (1926). Sie ist durch ihre äusserst schlanke Gestalt leicht von allen anderen Arten der *dissimilis*-Gruppe, deren Merkmale sie besitzt, zu unterscheiden. Auch die stark entwickelten Seitenrandeindrücke in Verbindung mit der langen seidigen Pronotum-Behaarung charakterisieren sie gut.

Ausser dem Typus lag mir ein Männchen vom Museum Stettin vor mit dem Fundort "Philippinen." Es weicht durch etwas weniger lange Fühler, vorn nicht ganz so breiten und eckigen Halsschild, sehr schwachen, durch einen feinen Mittelkiel geteilten Präscutellareindruck und halbmondförmige Discoidaleindrücke desselben und etwas gröbere Marmorierung der Flügeldecken etwas ab. Im Städtischen Museum für Natur-, Völker- und Handelskunde, Bremen, befindet sich ein kleines Männchen: Philippinen (*O. Schütze*), von 14.5 mm länge, während das Exemplar des Stettiner Museums 17.7 mm misst.

CALLIRRHIPIS SCHULTZEI sp. nov.

Zwei Männchen und Weibchen. PANAY, Antique, Culasi, Samml. W. Schultze (männlicher Typus jetzt Mus. Dresden, männlicher Paratypus und weiblicher Typus in Samml. W. Schultze).

Männchen.—Kastanienbraun, Flügeldecken grösstenteils, Bauch und Schenkel etwas heller, Schienen, Tarsen und Fühler hell rotbraun. Behaarung goldgelb bis graugelb, auf dem Halsschild ziemlich lang und fast anliegend, auf den Flügeldecken wenig lang doch länger als bei den meisten anderen Arten, die Lagerung auf den Decken vielfach wechselnd und infolgedessen eine dichte und kräftige Scheckung erzeugend, die sehr auffällig ist. Kopf ziemlich fein und sehr dicht punktiert. Drittes Glied der Kiefertaster zwei Dritteln so lang wie das 2. anderthalbmal so lang wie breit, das 4. knapp dreimal so lang wie breit. Fühler reichlich vier Fünfteln so lang wie der Körper. Schon das 5. Fühlerglied deutlich etwas länger als breit. Halsschild mässig lang, vorn stark gerundet, die Rundung jederseits der Mitte etwas abgeflacht, jedoch die Kontur nicht ausgeschweift, die Seiten durch den mässig entwickelten Seitenrandeindruck schmal aber nicht sehr flach ausgerandet, vom Seitenrandeindruck bis zur Basis fast geradlinig gleichmässig, ziemlich stark erweitert, am Vorderrand innerhalb der Vorderecken (die eigentlichen Vorderecken jedoch nicht eingerechnet) halb so breit wie an der Basis. Die herabgeschlagenen eigentlichen Vorderecken, die breit von oben sichtbar sind, kräftig gerundet als starke Augenlappen vorgezogen. Halsschildpunktierung äusserst fein und mässig dicht, die Zwischenräume der Punktierung nirgends ölig verfliessend. Präscutellareindrücke fast erloschen, Discoidaleindrücke gross und sehr tief, am Grunde fast unpunktiert, nach innen sehr scharf begrenzt, nach aussen etwas mit den verhältnismässig stark entwickelten Hinterecken-

eindrücken verfliessend. Halsschild in der ganzen Länge ziemlich gleichmässig wenig stark gewölbt. Schultern deutlich breiter als die Halsschildbasis, kräftig gerundet. Die Flügeldecken bis ans Ende des vierten Siebentels schwach gerundet erweitert, von da zur Spitze in sehr flacher Rundung gleichmässig verengt, die Spitze abgerundet. Die Rippen ausser der 3. stark erhaben, gleich hinter der Schulter als breite Erhöhungen hervortretend, ziemlich breit, durch begleitende unregelmässige Punktreihen ziemlich scharf begrenzt. Die gemeinsame Verlängerung zieht schräg zum Aussenrand. Hauptpunktierung sehr fein, bis auf die ziemlich groben Reihen entlang den Rippen. Grundpunktierung wenig fein, dicht und ziemlich tief. Das Basaldrittel der Flügeldecken (besonders die Naht) mit kräftiger Längswölbung, das folgende Drittel der Länge nach fast eben, das letzte flach zur Spitze abwärts gewölbt. Schienen und Tarsen sehr schlank, das 1. Glied beim Typus fast so lang wie die drei folgenden zusammen, beim Paratypus so lang wie die zwei folgenden zusammen, das 2. bis 4. Glied der Vordertarsen beim Typus länger als hoch, beim Paratypus fast so lang wie hoch. Länge 19.1 bis 21.4 mm, Schulterbreite 5.3 bis 6.2, Fühlerlänge 16.8 bis 17.8. (Das erste Mass bezieht sich jeweils auf den Typus.)

Weibchen.—Dem Weibchen von *grandicornis* Emden (1926) sehr ähnlich, doch der Halsschild viel weniger kurz (anderthalb mal so breit wie lang, bei *grandicornis* fast ein und drei Vierteln mal und die Flügeldecken viel kürzer gebaut, viermal so lang wie der Halsschild (bei *grandicornis* fast fünfmal), auch in den Zwischenräumen der Rippen stark glänzend. Vom Weibchen der *C. longitarsis* durch an der Spitze schmäleren Halsschild, sehr stark entwickelte Flügeldeckenrippen und zur Spitze mehr geradlinig verengte Flügeldecken auffällig verschieden. Merkmale der *dissimilis*-Gruppe: Braunschwarz gefärbt, Kopf ziemlich grob und ungleichmässig wenig dicht punktiert. Fühlerlamellen wenig lang, die des 5. Fühlergliedes fast doppelt so lang wie das zugehörige Glied. Halsschild vorn mässig breit gerundet, die Vorderrand-Kontur jederseits der Mitte kurz aber deutlich ausgerandet. Seitenrandeindruck schmal aber deutlich, die Halsschildseiten von da bis zu den Hinterecken fast geradlinig schwach erweitert. Scheibe fein und zerstreut, deutlich doppelt punktiert, die feineren Punkte (Grundpunktierung) eingestochen und verhältnismässig kräftig, doch sehr spärlich. Alle Eindrücke scharf getrennt. Discoidaleindrücke tief und rundlich, wenig gross, Präscutellareindrücke ziemlich flach.

Schildchen fein und äusserst zerstreut punktiert. Flügeldecken mit breiten, nach hinten stark erhabenen, wenn auch nicht sehr scharf begrenzten Rippen, deren gemeinsame Verlängerung kurz vor der Spitze wenig deutlich in den Aussenrand mündet. Seitenrand bis fast zur Spitze durch eine tiefe Randkehlung abgesetzt und kräftig aufgebogen (bei *grandicornis* vom Beginn des vierten Fünftels ab nur noch undeutlich wulstförmig abgesetzt), bis gegen die Mitte etwas schmäler als die Randkehle. Flügeldecken mit ziemlich breiten Schultern, dahinter lang und leicht ausgeschweift, zum Ende des zweiten Drittels ziemlich stark erweitert und dann ziemlich plötzlich in sehr flacher Rundung zur Spitze umbiegend. Flügeldecken auf der Basalwölbung nur mit ganz vereinzelten feinen Punkten, die Hauptpunktierung im übrigen ziemlich fein, etwas ungleich, gegen die Spitze ein wenig runzlig, die Grundpunktierung fein und äusserst zerstreut, die Rippen infolgedessen wie der Halsschild mit Hochglanz, die Zwischenräume matter glänzend, jedoch nicht matt, wie es bei *grandicornis* der Fall ist. Tarsen schlank, das Klauenglied zur Spitze etwas mehr verdickt als bei *longitarsis*, jedoch viel schlanker als bei *grandicornis*. Das 2. bis 4. Tarsenglied viel höher als lang. Länge 23.9 mm, Schulterbreite 7.3.

Durch den nach vorn stärker verengten Halsschild mit tiefen Discoidaleindrücken, kräftige Flügeldeckenrippen und schlanke Tarsen sowie im männlichen Geschlecht lange Fühler kenntlich.

CALLIRRHIPIS LONGITARSIS sp. nov.

Zwei Männchen und 1 Weibchen, PANAY, Antique, Culasi, Samml. W. Schultze (männlicher Typus jetzt Mus. Dresden, männlicher Paratypus und weiblicher Typus in Samml. W. Schultze).

Männchen.—Dunkel kastanienbraun, die Flügeldecken zur Spitze etwas heller, Tarsen und Fühler hell rotbraun, beim Paratypus rotbraun. Behaarung goldgelb bis graugelb, die Flügeldecken dicht und fein, doch wenig auffällig marmoriert. Kopf ziemlich grob und dicht punktiert, 3. Glied der Kiefertaster so lang wie das 2., anderthalb mal so lang wie breit, das 4. reichlich anderthalb mal so lang, kaum mehr als zweimal so lang wie breit. Fühler fast von Körperlänge oder doch (Paratypus) von drei Vierteln der Körperlänge. Erst das 8. Fühlerglied deutlich länger als breit. Halsschild mässig kurz, vorn breit und jederseits der Mitte flacher gerundet, jedoch die Kontur nicht ausgeschweift, die Seiten durch den flachen Seitenrandeindruck

nur flach ausgerandet (beim Paratypus der Seitenrandeindruck fast erloschen), vom Eindruck bis zur Basis fast geradlinig erweitert. Die herabgeschlagenen Vorderecken als breit gerundete Augenlappen schwach vorragend. Halsschildpunktierung ziemlich fein, zur Basis noch feiner werden, beim Typus dicht, beim Paratypus wenig dicht, die Zwischenräume der Punktierung bei diesem zum Teil etwas ölig verfliessend. Discoidal und Präscutellareindrücke beim Typus sehr flach, beim Paratypus tief, die Hintereckeneindrücke bei beiden verhältnismässig tief, alle Eindrücke gut voneinander getrennt. Halsschild in den apikalen zwei Dritteln ziemlich kräftig gewölbt, im Basal drittel eben. Schultern wenig breiter als dei Halsschildbasis, breit gerundet. Die Flügeldecken bis zum Ende des vierten Siebentels sehr schwach gerundet-erweitert, fast geradlinig und fast parallel, von da zur Spitze gleichmässig gerundet-verengt, die Spitze abgerundet. Die Rippen nur mässig erhaben, doch durch eine nicht ganz regelmässige Punktreihe jederseits deutlich begrenzt. Die gemeinsame Verlängerung der Rippen ist schräg nach hinten zum Aussenrand gerichtet, erreicht diesen jedoch nicht. Hauptpunktierung sehr fein (Typus) bis mässig fein (Paratypus), Grundpunktierung ziemlich fein, ziemlich dicht und wenig tief. Die Fläche zwischen den Rippen unregelmässig geknittert, viel mehr als bei den meisten anderen philippinischen Arten. Die Längswölbung flach und bis zur Spitze ziemlich gleichmässig, nur im mittleren Drittel fast eingeebnet. Schienen und Tarsen sehr schlank, beim Paratypus nur mässig schlank, das 1. Glied der Tarsen in der Mitte der Seiten so lang wie die drei folgenden Glieder zusammen. Das 2. Glied beim Typus an den Vorder- und Mittelbeinen länger als hoch, beim Paratypus an allen Beinen höher als lang, dementsprechend ist beim Typus das 3. and 4. Vordertarsenglied etwa so lang wie hoch oder doch wenig höher als lang, beim Paratypus viel höher als lang. Länge 17.8 bis 22.2 mm, Schulterbreite 4.6 bis 6.3, Fühlerlänge 17.5 beziehungsweise 16.7. (Das erste Mass bezieht sich stets auf den Typus, das zweite auf den Paratypus).

Wenn nicht auch bein *schultzei* eine beträchtliche, obwohl nicht ganz so grosse Variation in der Lange der Tarsenglieder festzustellen wäre, hätte ich diese beiden Männchen zwei verschiedenen Arten zugerechnet. Auch die übrigen Merkmale der beiden Stücke, die nicht ganz übereinstimmen, sind bei anderen Arten schon als variabel festgestellt worden (Fühlerlänge, Punktierung), an der Artgleichheit ist demnach trotz der Ver-

schiedenheiten kaum zu zweifeln. Das nachstehend beschriebene Weibchen schliesst sich mehr dem Typus an. Die Verlängerung der Tarsenglieder tritt bei den *Callirrhipis* Weibchen wie im gleichen Masse ein wie bei den Männchen.

Weibchen.—Den Weibchen von *C. javanica* Castelnau sehr ähnlich, sogar noch feiner punktiert und noch glänzender, doch viel robuster, grösser und durch die Merkmale der *dissimilis*-Gruppe (plattenförmig vorgezogenen vorderen Teil der Stirn und fehlende Seitenecke des Ovipositors) von ihm verschieden. Das einzige Stück ist rötlich kastanienbraun gefarbt. Kopf ziemlich grob punktiert. Die Fühlerlamellen sehr kurz, die des 5. Fühlergliedes knapp ein Viertel länger als das zugehörige Glied. Halsschild kurz und breit, reichlich anderthalb mal so breit wie lang, vorn sehr breit gerundet und jederseits der Mitte nicht ausgeschweift. Seitenrandeindruck sehr flach, die Seiten unmittelbar vor den Hinterecken kurz, doch ziemlich kräftig ausgeschweift. Halsschild fein und zerstreut, doch ziemlich gleichmässig punktiert. Discoidaleindrücke fehlen, die übrigen Eindrücke breit und deutlich. Schildchen sehr fein und äusserst zerstreut punktiert, der Grund von Halsschild und Schildchen mit Spuren einer ganz erloschenen, auf dem Schildchen etwas deutlicheren Punktulierung, die nur bei bestimmter Beleuchtung erkennbar sind. Flügeldecken in der Basalhalfte nicht gröber punktiert als der Halsschild, vor der Spitze mehr als doppelt so grob, die Hauptpunktierung jedoch überall ausserordenlich fein, die Grundpunktierung ganz vereinzelt und wenig fein. Die Rippen im Basaldrittel ganz erloschen, im übrigen schwach und breit erhaben, unscharf abgegrenzt. Seitenrand der Flügeldecken bis fast zur Spitze durch eine tiefe Kehle abgesetzt, diese zur Spitze nur wenig verbreitert, der Seitenrand nach hinten ebenfalls nur wenig verbreitert, in der ganzen Länge bis auf die äusserste Spitze scharf wulstförmig (gegen die Spitze als Aufbiegung) von der Randkehle abgesetzt und überall ebenso breit wie diese. Flügeldecken zum Ende des zweiten Drittels kräftig erweitert, dann stark gerundet verengt, an der Spitze breit abgerundet. Tarsen schlank. Das 1. Glied der Vordertarsen (in der Mitte der Seiten gemessen) etwas länger als die beiden folgenden zusammen, das 2. bis 4. Glied höher als lang. Länge 20.5 mm, Schulterbreite 6.1.

Durch die langen Fühler und das längere 1. Tarsenglied von *parallela* leicht zu unterscheiden, der *longitarsis* sonst im männlichen Geschlecht recht nahe steht. Im weiblichen Geschlecht

durch die extrem feine Hauptpunktierung der Flügeldecken, die diese an der Basis fast poliert erscheinen lasst, die scharfe Randung der Flügeldeckenseiten, die breit gerundete, fast gemeinsam etwas abgestutzte Flügeldeckenspitze und die kurzen Fühlerlamellen sehr ausgezeichnet.

CALLIRRHIPIS GRISEA sp. nov.

Männchen.—MINDORO, Abra de Ilog. Samml. W. Schultze. Schwarzgrau, die Tarsen und das 2. Fühlerglied kastanienbraun, der Rest der Fühler dunkelgraubraun gefärbt. Behaarung graugelb bis goldgelb, verschieden gelagert, sodass die Flügeldecken graugelb und dunkel gelblichgrau marmoriert erscheinen, diese Marmorierung deutlich, doch nicht sehr auffällig. Stirn über den Fühlern zerstreut und unregelmässig grob punktiert und gerunzelt, Scheitel dicht und regelmässig wenig grob, doch tief punktiert. Das 3. Kiefertasterglied etwa ein Zehntel kürzer als das 2., knapp ein Drittel länger als breit, das 4. etwa anderthalbmal so lang wie das 3., knapp drittehalbmal so lang wie dick. Fühler reichlich halb so lang (0.56 : 1) wie der Körper, erst das 7. Fühlerglied deutlich länger als breit. Halsschild kurz und breit, vorn breit und gleichmässig gerundet, die Seiten fast winklig ansetzend, am Seitenrandeindruck in grösser Ausdehnung fast geradlinig und nur unmerklich breit ausgerandet, da dieser flach und zudem mehr auf die Dorsalseite gerückt ist, in der Mitte zwischen Seitenrandeindruck und Basis fast stumpfwinklig umbiegend und bis zur Basis geradlinig nur noch ziemlich schwach erweitert. Die herabgeschlagenen Vorderecken als breite Augenlappen schwach vorragend. Halsschildpunktierung etwas ungleich, überall fein und wenig dicht, besonders in den Eindrücken und in der Mitte der Scheibe spärlicher, die Zwischenräume der Punktierung mit Ausnahme des herabgeschlagenen Pronotumteils nirgends runzlig oder ölig zusammenfliessend, kaum stellenweise etwas gewölbt. Die Halsschildeindrücke gut abgegrenzt, die Discoidaleindrücke rundlich und tief, auch die länglichen Hintereckeneindrücke verhältnismassig ziemlich tief. Halsschild in der Apikalhälfte mässig gewölbt, in der Basalhälfte flach. Schultern wenig breiter als die Halsschildbasis, breit gerundet. Die Flügeldecken bis zum Ende des vierten Siebentels etwas erweitert, die Seiten bis dahin sehr schwach gerundet, von da zur Spitze gleichmässig gerundet verengt, die Spitze selbst kurz abgerundet. Die 1., 2. und 4. Rippe, abgesehen von der Basis, ziemlich breit und gleichmässig,

doch wenig stark erhaben. Die gemeinsame Verlängerung der vereinigten Rippen mündet, sich verflachend, undeutlich in den Aussenrand. Hauptpunktierung der Fügeldecken fein und mässig dicht, Grundpunktierung mässig fein, flach und wenig dicht. Die Längswölbung der Flügeldecken ziemlich erheblich und gleichmässig bis zur Spitze fortgesetzt. Schienen und Tarsen ziemlich schlank, das 2. Glied der Tarsen etwas kürzer als das 2. und 3. zusammen, das 2. bis 4. an den Mittel- und Hintertarsen etwa doppelt so hoch wie einzeln lang. Das Klauenglied ziemlich robust. Länge 19.5 mm, Shulterbreite 6, Fühlerlänge 11.0.

Die Art besitzt alle Merkmale der *dissimilis*-Gruppe. In ihr ist sie ausser durch die schwarzgraue Färbung durch die auffallend kurze und robuste Gestalt leicht kenntlich. Von der einzigen ähnlich kurzen Art *templetoni* Westwood unterscheidet sie sich ausser durch die Färbung und Skulptur durch die gerundete Aussenseite der Flügeldeckenspitze und das Fehlen der Bürste auf dem zweiten und dritten freien Abdominalsternit.

CALLIRRHIPIS BAKERI sp. nov.

Männchen.—INSEL SAMAR (*Baker*). Kastanienbraun, die Fühler vom 2. Glied ab lichtbraun. Behaarung goldgelb bis hellbraun, die Flügeldecken durch ihre wechselnde Legerung dicht und ziemlich fein, sehr auffällig gescheckt. Kopf bis auf die weitgehend geglättete Mitte der Stirn sehr dicht und ziemlich fein punktiert. Drittes Glied der Kiefertaster etwas kürzer und etwas schmäler als das 2., ein und ein Viertelmal so lang wie breit, zur Spitze ebenso wie das 2. ziemlich stark verbreitert, das 4. ein und zwei Drittelnmal so lang wie das 3., drittehalbmal so lang wie breit. Fühler sieben Zehnteln so lang wie der Körper, 2. bis 8. Fühlerglied stark quer, das 9. schwach quer, das 10. etwas länger als breit, die Lamellen in der Mitte ihrer Länge anderthalbmal so breit wie nahe Basis und Spitze. Halsschild kurz, vorn breit und jederseits der Mitte flacher gerundet, die Kontur dort wenig deutlich ausgeschweift. Die Seiten durch den flachen und wenig scharf begrenzten Seitenrandeindruck schwach ausgeschweift, dahinter durch die äusserst grobe höckerige Runzelung der Seitenflächen im Profil mit drei bis fünf flachen Höckerchen, gegen die Hinterecken flach gerundet erweitert, die Hinterecken selbst sehr schwach eingezogen. Die herabgeschlagenen Vorderecken als gerundete Augenlappen ziemlich kräftig vorragend, bei binokularer dorsaler Betrachtung durch die breit vorstehenden abgerundet-stumpfwinkligen

Konturvorderecken verdeckt. Halsschildpunktierung sehr fein und wenig dicht, zur Mitte der Basis äusserst fein und spärlich werdend, die Zwischenräume der Punktierung nach vorn zu vielfach öligverfliessend. Präscutellareindrücke sehr gross und tief, kaum weniger tief als die kleinen, runden aber ziemlich tiefen und ringsum gut begrenzten Discoidaleindrücke. Vor und ausserhalb jedes Discoidaleindruckes befindet sich ein weiterer ähnlicher runder und ziemlich tiefer (vielleicht nur monströser?) Eindruck. Hintereckeneindrücke breit und deutlich, mässig tief, nach vorn und aussen mit einigen groben, breiten Runzeln. Halsschild in den apikalen drei vierteln ziemlich gleichmässig und wenig stark gewölbt, am Beginn des Basalviertels sehr flach eingesattelt und unmittelbar an der Basis wieder etwas konvex gewölbt. Schildchen kaum breiter als lang, vor der Mitte am breitesten und nach hinten abgerundet-zugespitzt, sehr fein und ziemlich dicht punktiert. Schultern breit gerundet, wenig breiter als die Halschildbasis. Flügeldecken bis zum Ende des vierten Siebentels deutlich ausgeschweift-erweitert, von da zur Spitze gleichmässig in flacher Rundung verengt, am Ende ziemlich spitz abgerundet. Die 1., 2. und 4. Rippe von der Mitte bezüglich von vor der Mitte bis zu ihrer Vereinigung sehr breit und stark dachförmig erhaben, die Punkte in den die eingentlichen Rippen begrenzenden Punktreihen zwar ziemlich grob, doch wenig dicht und wenig regelmässig angeordnet, der Kamm der Rippen infolgedessen unscharf in die dachförmig abfallenden benachbarten Teile der Zwischenräume übergehend. Die gemeinsame Verlängerung der Rippen ist schräg nach hinten zum Aussenrand erichtet, erlischt jedoch in der Absetzung des Seitenrandes. Hauptpunktierung mässig fein und mässig dicht. Grundpunktierung ziemlich fein und ziemlich dicht. Die Fläche zwischen den Rippen wenig stark unregelmässig geknittert. Die Längswölbung in der Basalhälfte stark, in der Apikalhälfte schwach und nur vor der Spitze wieder deutlicher, die Naht im fünften Siebentel sogar etwas eingedrückt, die Querwölbung der Flügeldecken ziemlich stark. Schienen und Tarsen mässig schlank, Tarsen viel kürzer als die Schienen, die ersten vier Tarsenglieder viel höher als lang, zusammen viel kürzer als das Klauenglied. Länge 24.5 mm, Schulterbreite 7.1, Fühlerlänge 17.0.

Durch ihre Grösse, robuste Gestalt, die breiten, starken Rippen, die akzessorischen Halsschildeindrücke und die starke Runzelung der Seitenflächen des Halsschildes ist diese Art von allen anderen Arten ihrer Gruppe leicht zu unterscheiden.

CALLIRRHIPIS PARALLELA sp. nov.

Männchen und Weibchen. NEGROS, Cuernos Mts. (*Baker*, Männchen, *20965*).

Männchen.—Dunkel kastanienbraun, Beine kastanienbraun, Fühler lichtbraun. Behaarung goldgelb bis grau goldgelb, die Flügeldecken dicht und fein doch nich sehr auffällig gescheckt erscheinend. Kopf ziemlich grob und äusserst dicht punktiert. Drittes Glied der Kiefertaster so lang und breit wie das 2., wenig länger als an der Spitze breit, dort wesentlich breiter als an der Basis, das 4. reichlich anderthalbmal so lang, zweimal so lang wie breit. Fühler drei Fünfteln so lang wie der Körper, das 7. Glied etwa so lang wie breit, die folgenden länger als breit. Halsschild sehr kurz und breit, doppelt so breit wie lang, vorn in der Mitte sehr breit gerundet, seitlich davon ziemlich kräftig ausgeschweift, die Konturvorderecken fast stumpfwinklig. Die Seiten an den kleinen, doch kräftigen und ziemlich scharf begrenzten Seitenrandeindrücken in der Kontur nicht ausgerandet, vom Eindruck bis zu den nicht eingezogenen Hinterecken in sehr flacher Rundung erweitert, unmittelbar an der Basis am breitesten. Die herabgeschlagenen Vorderecken als sehr breit gerundete Augenlappen schwach vorragend, ihr Vorderrand bei binokularer, dorsaler Betrachtung des Halsschildes gerade zu erkennen. Halsschildpunktierung ziemlich fein und mässig dicht, zur Basis sehr fein werdend, die Zwischenräume der Punktierung auf der Scheibe vielfach runzlig bis ölig verfliessend. Discoidaleindrücke sehr tief, Präscutellareindrücke gross und ziemlich tief, Hintereckeneindrücke deutlich und ebenfalls verhältnismässig tief, alle Eindrücke gut voneinander getrennt. Halsschild in den apikalen drei Vierteln ziemlich flach gewölbt, im Basalviertel eben, Schultern sehr wenig breiter als die Halsschildbasis, sehr flach gerundet, die Flügeldecken sehr schlank, zwei und drei Vierteln so lang wie zusammen an den Schultern breit, bis zum Ende des zweiten Viertels äusserst flach und gleichmässig gerundet, dem unbewaffneten Auge bis dahin völlig parallel erscheinend, von da in flachem Bogen zur Spitze verengt, kurz vor der Spitze stärker gerundet, diese selbst aber nur schmal abgerundet. Die Rippen sehr flach und breit, überall unscharf in die Zwischenräume übergehend, die begrenzenden Punktreihen mässig deutlich, an der Basis wöllig eingeebnet, bis zur Mitte äusserst schwach erhaben, nur die 2. und 4. vor der Vereinigung etwas stärker hervortretend, die gemeinsame Verlängerung undeutlich. Die Zwischenräume der Rippen in der Basalhälte eben, nur stellenweise fast unmerklich konkav,

vor der Vereinigung der Rippen schwach konkav. Hauptpunktierung ziemlich fein und wenig dicht, sehr gleichmässig, und der Grund zwischen ihr nur äusserst schwach geknittert. Grundpunktierung ziemlich fein, mässig dicht und wenig tief. Flügeldecken im Basal- und Apicaldrittel mit kräftiger Längswölbung, das mittlere Drittel fast eben, Querwölbung ziemlich stark. Schienen und Tarsen wenig schlank, das erste Glied der letzteren etwa so lang wie die zwei folgenden zusammen, diese und das 4. höher als lang. Länge 18 mm, Schulterbreite 4.8, Fühlerlänge 10.8.

Weibchen.—Durch die sehr schlanken Flügeldecken mit schwach entwickelten Rippen und—auch vor der Vereinigung der letzteren—äusserst schwacher Konkavwölbung viel mehr an die Weibchen der *trepida*-Gruppe als die der *dissimilis*-Gruppe erinnernd, doch schon nach der Bildung des Stirnvorderteils als zu letzterer Gruppe gehörig erkennbar. Kopf ziemlich grob und ungleichmässig punktiert. Fühlerlamellen lang und sehr eng gestellt, die des 5. Gliedes fünftehalbmal so lang wie das zugehörige Glied, das 11. Glied langgestreckt, linear, etwas länger als das 7. bis 10. Glied zusammen, das 4. Glied etwa so lang wie breit, das 5. bis 10. länger als breit. Halsschild in der Anlage dem des Männchen ähnlich, doch etwas breiter und etwas gleichmässiger gewölbt, mit weniger starken, doch immer noch kräftigen Eindrücken, zerstreut und ungleichmässig punktiert, hinten an den Seiten fein runzlig. Zwischen der verhältnismässig feinen Hauptpunktierung findet sich eine äusserst flache, fast erloschene, doch wenig feine und mässig dichte Grundpunktierung. Schildchen ähnlich wie beim Männchen doch viel breiter, spärlich und sehr fein punktiert, mit erloschener Grundpunktierung dazwischen. Flügeldecken bis zum Ende des zweiten Drittels leicht erweitert, dann in ziemlich flacher Rundung gleichmässig verengt, Rippen in der Basalhälfte kaum merklich, in der Apikalhälfte schwach erhaben, die gemeinsame Verlängerung deutlich, nach dem Aussenrand gerichtet, ihn jedoch nicht deutlich erreichend. Hauptpunktierung mässig fein, etwas nadelrissig, gegen die Spitze runzlig. Grundpunktierung wenig fein aber äusserst zerstreut und daher leicht zu übersehen. Schienen und Tarsen wenig schlank. Länge 26 mm, Schulterbreite 7.7, Fühlerlänge 6.

Diese Art ist durch die schlanke, parallele Gestalt bei schwach ausgeprägten Rippen der Flügeldecken und wenig langen Fühlern und kurzen Tarsen kenntlich.

CALLIRRHIPIS LUZONICA sp. nov.

Männchen. LUZON, Tayabas, Malinao (*Baker*).

Männchen.—Dunkel kastanienbraun, die Flügeldecken gegen die Spitze, die Unterseite, Tarsen und Fühlerlamellen etwas heller. Behaarung bräunlich-goldbelb bis grau-goldgelb, die Flügeldecken dicht und fein gescheckt erscheinend. Kopf wenig grob und ziemlich dicht punktiert. Drittes Glied der Kiefertaster so lang und breit wie das 2., an der Spitze so breit wie lang, dort wesentlich breiter als an der Basis, das 4., ein und drei Viertelnmal so lang, zweimal so lang wie breit. Fühler reichlich halb so lang wie der Körper (0.51 : 1), das 7. Glied etwas so lang wie breit, die folgenden länger als breit. Halsschild mässig kurz, reichlich anderthalbmal so breit wie lang, vorn in der Mitte breit gerundet, seitlich davon geradlinig abgeschrägt, nicht merklich ausgerandet, die Konturvorderecken abgerundet. Die Seiten an den sehr flachen, breiten Seitenrandeindrücken in der Kontur nicht ausgerandet, bis zu den nicht eingezogenen Hinterecken in sehr flacher Rundung erweitert, unmittelbar an der Basis am breitesten. Die herabgeschlagenen Vorderecken als sehr breit gerundete Augenlappen schwach vorragend, ihr Vorderrand bei dorsaler binokularer Betrachtung eben sichtbar. Halsschildpunktierung ziemlich fein und mässig dicht, zur Mitte der Basis feiner, nach aussen etwas gröber werdend, die Zwischenräume vorn auf der Scheibe sehr wenig ölig erhaben, an den Seiten ausserhalb der Discoidaleindrücke etwas runzlig verfliessend. Discoidaleindrücke mässig gross, ziemlich tief, Präscutellareindrücke ziemlich gross und ziemlich tief, Hintereckeneindrücke deutlich und ebenfalls verhältnismässig tief. Letztere von den Discoidaleindrücken wenig scharf getrennt, die Eindrücke im übrigen gut voneinander getrennt. Halsschild in den apikalen zwei Dritteln ziemlich flach gewölbt, im Basaldrittel eben. Schultern wenig breiter als die Halsschildbasis, flach gerundet, die Flügeldecken ziemlich robust, zwei und zwei Drittelnmal so lang wie zusammen an den Schultern breit, bis zum Ende des dritten Fünftels schwach ausgeschweift-erweitert, dann in sehr schwachem Bogen, weiterhin fast geradlinig, am Ende wieder flach gerundet zugespitzt, die Spitze selbst ziemlich schmal abgerundet. Die Rippen breit und stark erhaben, allmählich in die konkaven, ziemlich grob geknitterten Zwischenräume übergehend, die begrenzende Punktreihe jederseits wenig regelmässig, die gemeinsame Verlängerung der Rippen wenig deutlich, sie strebt dem Aussenrand zu, erlischt jedoch

vorher. Die Zwischenräume der Rippen in der Basalhälfte deutlich, in der Apikalhälfte kräftig konkav. Hauptpunktierung wenig grob und mässig dicht, etwas ungleichmässig. Grundpunktierung wenig fein, mässig dicht, ziemlich tief. Flügeldecken in der Basalhälfte mit ziemlich kräftiger Längswölbung, in der Apikalhälfte der Länge nach fast eben und nur zur Spitze wieder leicht abwärts gewölbt. Querwölbung wenig stark. Schienen und Tarsen wenig schlank, das 1. Glied der letzteren etwa so lang wie die zwei folgenden zusammen, diese und das 4. höher als lang. Länge 18.8 mm, Schulterbreit 5.4, Fühlerlänge 10.8.

Unter den Arten der *dissimilis*-Gruppe mit verhältnismässig kurzen männlichen Fühlern durch kräftige Rippen der Flügeldecken und die in der Mitte des Halsschildes nicht runzlig und kaum ölig verfliessenden Zwischenräume der Punktierung gekennzeichnet. Der *C. dissimilis* sehr ähnlich, doch von ihr und *antennaria* durch viel robustere, an der Spitze stärker nach aussen gebogene Schienen und robustere Körperform, auf der parallelen Stirn breiter getrennte Augen und weniger kurzen Halsschild unterschieden.

CALLIRRHIPIS RUGICOLLIS sp. nov.

Drei Männchen, 2 davon "Philippinen," 1 "Luzon," Naturkunde-Museum Stettin.

Männchen.—Rötlich kastanienbraun, Kopf, Halsschild und Unterseite der Brust etwas dunkler. Behaarung bräunlich goldgelb, die Flügeldecken dicht und fein gescheckt erscheinend. Kopf grob und dicht punktiert. Drittes Glied der Kiefertaster ein Fünftel kürzer als das 2., ebenso breit, ein Achtel länger als breit, das vier und ein Achtel schmäler, reichlich zwei und zwei Drittelnmal so lang wie breit. Fühler drei Fünfteln bis zwei Dritteln so lang wie der Körper (0.63-0.67), erst das 8. bis 9. Glied länger als breit. Halsschild ziemlich kurz und breit, reichlich ein und drei Fünftelnmal so breit wie lang, nach vorn ziemlich stark verengt, vorn in der Mitte flach gerundet, seitlich davon abgeschrägt, die Kontur nicht merklich ausgerandet, die Konturvorderecken breit abgerundet Die Seiten an den flachen Seitenrandeindrücken in der Kontur nicht ausgerandet, bis zu den nicht eingezogenen Hinterecken gerundet–erweitert, unmittelbar an der Basis am breitesten. Die herabgeschlagenen Vorderecken als breit gerundete Augenlappen schwach vorragend, bei dorsaler binokularer Betrachtung deutlich sichtbar. Halsschildpunktierung mässig fein und mässig dicht, zur Basis

feiner werdend, die Zwischenräume überall stark ölig verfliessend, an den Seiten von den Hintereckeneindrücken ausgehend stark runzlig verbunden. Discoidaleindrücke mässig gross, tief, Präscutellareindrücke mässig gross und ziemlich tief, Hinterekkeneindrüke gross und verhältnismässig tief, von den Discoidal- und Seitenrandeindrücken wenig scharf getrennt, die Eindrücke im übrigen gut voneinander geschieden. Halsschild in den apikalen zwei Dritteln ziemlich flach gewölbt, im Basaldrittel eben. Schultern etwas breiter als die Halsschildbasis, breit gerundet, die Flügeldecken mässig robust, zwei und zwei Drittelnmal so lang wie an den Schultern zusammen breit, bis zum Ende des dritten Fünftels schwach ausgeschweift erweitert, dann in sehr flachem Bogen verengt, am Ende kurz abgerundet-zugespitzt. Die Rippen wenig breit und wenig stark erhaben, jederseits durch eine ziemlich regelmässige Punktreihe sehr scharf von den schwach konkaven, ziemlich fein geknitterten Zwischenräumen abgegrenzt. Die gemeinsame Verlängerung der Rippen erreicht die Seitenrandkehle, ohne an den Rand selbst zu gelangen. Hauptpunktierung grob und dicht, etwas ungleichmässig. Grundpunktierung wenig fein, mässig dicht, ziemlich tief, die Zwischenräume leicht querrunzelig verbunden. Flügeldecken in den basalen zwei Fünfteln mit ziemlich kräftiger Längswölbung, in den folgenden zwei Fünfteln fast eben, im Apikalfünftel zur Spitze flach abswärts gewölbt, unmittelbar vor dem Ende ist die Kontur flach ausgerandet. Querwölbung wenig stark. Schienen und Tarsen wenig schlank, das 1. Glied der letzteren etwa so lang wie die zwei folgenden zusammen, diese und das 4. viel höher als lang. Länge 20.5 bis 22.5 mm, Schulterbreite 6.1 bis 6.6, Fühlerlänge 13 bis 15.

Noch näher mit *C. dissimilis* verwandt als die vorige Art, von ersterer durch bedeutendere Grösse, robustere, zur Spitze stärker erweiterte und mehr nach aussen gebogene Schienen und stärker zugespitzte Flügeldecken unterschieden.

CALLIRRHIPIS RELLERI Schultze (1915).

Männchen (*Typus*).—LUZON, Laguna, Paete, Samml. Schultze. Auffällig grosse Form der *trepida*-Gruppe mit sehr feiner Punktierung, doch ohne Knitterung der Flügeldecken. Halsschild nur 1.32 mal so breit wie lang, also auffällig lang, nach vorn mässig verengt, vorn sehr breit gerundet, mit erloschenem Seitenrandeindruck, ziemlich kräftigen Discoidal- und ziemlich flachen Präscutellareindrücken, sehr fein und wenig dicht punktiert. Flügeldecken von Form und Behaarung der *trepida*-

Gruppe, Rippen leicht erhaben, Hauptpunktierung fein und wenig dicht, etwas ungleichmässig. Grundpunktierung äusserst fein, eingestochen, wenig dicht. Fühler sehr lang. Parameren und Penis ähnlich wie bei *dissimilis*, doch robuster und erstere deutlicher einwärts gebogen, weniger zugespitzt. Die fünf (davon ein jetzt im Museum für Tierkunde zu Dresden) männliche Stücke des Städtischen Museums für Natur-, Völker- und Handelskunde, Bremen, sind wesentlich kleiner als der Typus, sodass die Art für die *trepida*-Gruppe zwar noch gross zu nennen ist, aber durch die Grösse doch nicht mehr auffällt, und der Halsschild ist zum Teil etwas weniger schlank als bei diesem. Die Discoidaleindrücke sind bei einem Teil der Stücke verflacht. Fundort: PHILIPPINEN (*O. Schütze*); ein Stück, PHILIPPINEN, Papatahan (*O. Schütze*).

Das Weibchen von *Callirrhipis helleri* unterscheidet sich, wenn ich die betreffenden beiden Stücke von Mt. Maquiling (*Baker*), Mus. Dresden bezw. N. O. Luzon, Mus. Stettin, die mir unverhältnismässig klein erscheinen (16.4 bez. 15.0 mm), richtig bestimmt habe, vom Männchen ausser durch die allgemeinen Merkmale der Weibchens durch nicht vorgezogenen, in der Mitte breit bogenförmig ausgeschnittenen Vorderteil der Stirn. Der Ovipositor its der der *trepida*-Gruppe. Vom Weibchen der *C. antiqua* Waterhouse weicht es durch viel feinere und viel weniger dichte Punktierung von Halsschild und Flügeldecken sowie kürzere Fühlerlamellen ab. Die feine Punktierung trennt die beiden Stücke auch von allen anderen mir bekannten Weibchen der *trepida*-Gruppe ausser *robusta, formosana, javanica* und *nigrescens*. Von diesen sind sie wieder durch dichtere und etwas kräftigere Halsschild- oder doch (*formosana*) Flügeldeckenpunktierung zu unterscheiden.

CALLIRRHIPIS HELLERI MERIDIONALIS subsp. nov.

Zwei Männchen, MINDANAO, Surigao (*Baker, 16119*); 1 Männchen, SAMAR (*Baker, 22702*). Kleiner (14.4 bis 15.4 mm) als die Stammform (17 bis 19 mm), ihr sehr ähnlich, der Halsschild etwas stärker quer, anderthalbmal so lang wie breit (bei der Stammform ein und ein Drittel bis anderthalbmal) die Discoidaleindrücke gegen die Hintereckeneindrücke etwas deutlicher geschieden. Fühler reichlich drei Vierteln (Mindanao) bis fast neun Zehnteln (Samar) so lang wie der Körper, schon das 5. bis 6. Glied deutlich länger als breit, bei der Stammform erst das 8. bis 9. Rippen der Flügeldecken etwas deutlicher erhaben, besonders hinter der Vereinigung der beiden ersten,

wo die Fläche der Flügeldecken innerhalb der Verlängerung der Rippen bei *meridionalis* einen flachen, doch deutlichen Längseindruck aufweist, die Punktreihen entlang den Rippen kräftiger und dichter als die Hauptpunktierung der Zwischenräume. Die Rundung der Flügeldeckenseiten zur Spiter erfolgt weniger allmählich, wodurch die Rosse etwas robuster erscheint. Länge 14.4 bis 15.4 mm, Schulterbreite 4.2 bis 4.4, Fühlerlänge 11.2 bis 13.4.

CALLIRRHIPIS ANTIQUA Waterhouse (1877).

Callirrhipis viracensis SCHULTZE (1918).

Männchen (*Typus von viracensis*).—CATANDUANES, Virac (*Schultze*). Gehört zu der schwierigen *trepida*-Gruppe; mit grober Hauptpunktierung der Flügeldecken. Da Waterhouse ausdrücklich erwähnt, dass der Halsschild allmählich nach vorn verengt sei, wenn auch nicht viel, und dass die Halsschildeindrücke nicht tief sind, was gerade an dem Typus von *viracensis* auffällt, so muss man wohl *antiqua* Waterhouse (*nec* Schultze, 1915) und *viracensis* als synonym ansehen, wenn es auch nicht unmöglich ist, dass *viracensis* nach Bekanntwerden weitern Materiales als Lokalform (natio) wieder aufleben kann. Denn die mir von den verschiedenen Philippinen-Inseln vorliegenden Einzelstücke weisen sämtlich gewisse Unterschiede voneinander auf. Auch die von Luzon vorliegenden Stücke sind—abgesehen von den bekanntlich sehr bedeutenden Geschlechtsunterschieden—nicht völlig übereinstimmend, insbesondere weist dass Männchen des Stettiner Museums im Gegensatz zu den anderen *antiqua*-Exemplaren einen kräftigen Seitenrandeindruck auf. Dieses Männchen von N. O. Luzon und der Schultzesche Typus weichen von den übrigen durch mehr parabolische Halsschildform und wenig feine, wenig dichte Halsschildpunktierung ab. Demgegenüber besitzt ein Männchen von N. W. Panay (*Baker*) etwas längeren, nach vorn viel breiteren Halsschild mit etwas feinerer und etwas dichterer Punktierung sowie etwas feinere Hauptpunktierung der Flügeldecken. Ein Männchen von Mindanao, Iligan (*Baker*), weist eine wesentlich gröbere und dichtere Halsschildpunktierung und Flügeldecken-Hauptpunktierung auf, während ein Männchen von Negros, Cuernos Mts. (*Baker, 20659*), auf dem ähnlich gestalteten Halsschild etwas gröber, auf den Flügeldecken etwas feiner punktiert erscheint als das von Panay. Die Fühler erscheinen bei den Tieren der mittleren Philippinen eine Kleinigkeit länger. In der Körperform sind die von Panay bis Mindanao robuster und grösser als die der Nordphilippinen. Jedoch schliesst sich ein Männchen

von Polillo (Samml. W. Schultze) in Körperform, Grösse und Punktierung ganz eng an das von Panay an. Ich halte es demgemäss für unrätlich, nach dem mir augenblicklich bekannten Material Lokalformen abzugrenzen und zu benennen.

CALLIRRHIPIS TIAONGONA Schultze (1915).

Männchen (*Typus*).—LUZON, Tayabas, Samml. Schultze. Sehr nahe mit *C. lineata* Waterhouse (1877) verwandt, wie W. Schultze in seiner Beschreibung schon hervorhob. Die Art unterscheidet sich von *lineata* dadurch, dass die Behaarung und deshalb naturgemäss auch die Grundpunktierung auch ausserhalb der Rippen stark entwickelt ist, während beides sich bei *lineata* fast ausschliesslich auf den Rippen verdichtet hat. Nur der Schildchenstreif und manchmal die Basis der 1. Rippe ist auch bei *tiaongona* dichter behaart. Es kann also *lineata* von *tiaongona*, nicht umgekehrt abgeleitet werden. Fürs weibliche Geschlecht, das von *tiaongona* noch unbekannt ist, gelten diese Unterschiede natürlich nicht. Beim Männchen von *scutellata* Fairmaire (1887) fehlt die Grundpunktierung und Behaarung bis auf vereinzelte Spuren auf den Flügeldecken völlig. *Callirrhipis tiaongona* kenne ich noch von Luzon, Mt. Maquiling (*Baker*), Mindanao, Butuan (*Baker*), Salawati (Mus. Berlin), und Batjan (Mus. Kopenhagan). Die beiden Molukkenstücke weichen nur unbedeutend, vor allem durch etwas kräftigere Punktierung, ab.

CHIRONOMIDÆ FROM JAPAN (DIPTERA)
II. MARINE TANYTARSUS [1]

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TWO PLATES

The chironomid flies discussed in the present report were taken entirely at Seto, Wakayama Prefecture, near the Marine Biological Station of the Kyoto Imperial University in the survey of the seashore and marine insects. This important series has added materially to our knowledge of the marine Chironomidæ. Only two species of marine *Tanytarsus* have been described, so far as I know. These are *T. maritimus* Edwards and *T. halophilæ* Edwards, which were collected by Dr. P. A. Buxton from a lagoon in the Samoan Islands. I am greatly indebted to Prof. Dr. Hachiro Yuasa for his kind help and for reading the manuscript of this report.

The abbreviations used in the text are taken mainly from those of F. W. Edwards.[2] A. R. is the ratio of length between the ultimate joint and the remaining joints of the antenna excepting the scape taken together. L. R. is the ratio of length between the basitarsus and the femur of the foreleg. Concerning the hypopygium, the appendage 1 is dorsal; appendage 1_a, supplementary; appendage 2, intermediate; 2_a, ventral, according to Goetghebuer;[3] and 1_b, accessory appendage between 1 and 1_a. Venational terminology used is that of the Comstock-Needham-Tillyard system, which differs from that of Edwards in the following points: M, Cu_1, and Cu_2 of the latter apply to M_{1+2}, M_{3+4}, and Cu_1 of the former, respectively; and fCu of Edwards means the fork between Cu_1 and Cu_2, while that in the text refers to the fork between M_{3+4} and Cu_1.

[1] Contribution from the entomological laboratory of the Kyoto Imperial University, No. 29.

[2] British non-biting midges (Diptera, Chironomidae), Trans. Ent. Soc. London (1929) 279–430.

[3] Chiromariae, Faune de France 18 (1928) 1–171.

Key to the marine species of Tanytarsus.

MALES

1. Wings without macrotrichiæ on the membranous area. *T. pontophilus* sp. nov.
   Wings with macrotrichiæ on the membranous area ..... 2.
2. Cell M_4 without macrotrichiæ ..... 3.
   Cell M_4 with macrotrichiæ ..... 4.
3. Hypopygium with 1_b; fCu located just below the basal section of Rs. *T. boodleæ* sp. nov.
   Hypopygium without 1_b; fCu located far beyond the basal section of Rs. *T. maritimus* Edwards.
4. Anal point of the ultimate tergite chitinized and pointed. *T. pelagicus* sp. nov.
   Anal point of the ultimate tergite membranous and blunt ..... 5.
5. Distal joint of the antenna much longer than the preceding three joints taken together ..... *T. magnihamatus* sp. nov.
   Distal joint of the antenna subequal in length to the preceding three joints taken together ..... *T. halophilæ* Edwards.

FEMALES

1. Cerci elongated and pointed ..... 2.
   Cerci short and of various forms ..... 5.
2. Wings very scantily haired and cell M_4 bare ..... *T. pontophilus* sp. nov.
   Wings moderately haired and cell M_4 hairy ..... 3.
3. fCu located just below the basal section of Rs. *T. magnihamatus* sp. nov.
   fCu located far beyond the basal section of Rs ..... 4.
4. Joints 3 and 4 of antenna without distinct necks. *T. halophilæ* Edwards.
   Joints 3 and 4 of antenna with necks, slender at each end. *T. maritimus* Edwards.
5. Antenna 5-segmented ..... *T. boodleæ* sp. nov.
   Antenna 6-segmented ..... *T. pelagicus* sp. nov.

TANYTARSUS BOODLEÆ sp. nov.

This species lives in association with *Pontomyea pacifica* Tokunaga between the tide marks in the shallow tide pool the bottom of which is thickly covered with the alga *Boodlea coactata*.

The imagines swarm actively on the edge of the tide pool at night and are most active about two hours after sunset. The larvæ and pupæ nest among the algal filaments, using the débris of algæ.

Male.—Body 1.9 to 2 millimeters in length; thorax brown with deep brown dorsal stripes; abdomen yellowish white.

Eyes bare, comparatively broad, reniform, not widely separated from each other; distance between them on the dorsal side about half as great as the vertical length of the eye. Antennæ 14-segmented; distal joint very short, shorter than the preceding three

joints taken together and sometimes reduced to about twice as long as the preceding one joint, with two small setæ at its tip; A. R. about 0.2 (8 : 36). Maxillary palpi distinctly 4-segmented (37 : 25 : 18 : 6). Clypeus setigerous with long setæ.

Pronotum vestigial, not visible from above; præscutum produced forwards over the head, provided with three longitudinal rows of erect setæ between the dorsal stripes; supra-alar setal group represented by a variable number of setæ (2 to 4); scutellum pale brown, provided with six large and two small setæ.

Hypopygium (Plate 1, fig. 7) generally yellowish white; ultimate tergite scantily haired with small setæ; anal point completely atrophied; coxites very broad, each with three stiff setæ on the ventromesal margin; appendage 1 swollen dorsad, bearing two small setæ on the mesal part and a tuberculated patch consisting of three minute setæ on the proximal part, pointed mesad, with one or two small setæ on its tip; 1_a with a terminal knob on which three minute setæ are found; 1_b located between the above two appendages, fingerlike, pointed, quite smooth; 2 extended at the middle of the style, setæ on its tip not curved distinctly, small setæ along its dorsomesal ridge extended cephalad; 2_a small, slender, bearing many minute, branched setæ on its tip.

Legs pale yellow; forelegs each with a fixed tibial spine; L. R. about 1.57; middle and hind legs provided with two combs on each leg; combs occupying about two-thirds of the circumference of the tibia, widely separated from each other; one comb with a long spur which is nearly thrice as long as the comb itself, the other with a much shorter spur, being almost twice as long as the comb; claws slender, unserrated; empodium slender; pulvilli slightly shorter than the claw and subequal in length to the empodium, covered entirely with minute hairs.

Wings (Plate 1, fig. 1) hyaline under transmitted light, without markings, scantily haired on the cells R_5 and M_2; anal angle fairly developed; squama quite bare; R_{4+5} ending slightly beyond the level of the tip of M_{3+4}, twice as long as R_1, slightly curved along the costal margin; r-m twice as long as the basal section of Rs; fCu narrow, located just below the basal section of Rs; M_{3+4} a slightly bent caudad at its tip; Cu_1 almost straight; 1A slightly curved caudad, scarcely reaching the base of fCu.

Female.—Body slightly longer than in the male, 1.9 to 2.2 millimeters in length. Thorax pale brown, with brown dorsal stripes, scutellum pale brown; other parts of the body generally whitish. Eyes far broader than in the male. Antennæ 5-seg-

mented (23 : 10 : 10 : 22 : 12); second proximal joint deeply constricted at middle; distal joint slightly longer than the preceding two joints taken together, with two or three apical setæ. Wings (Plate 1, fig. 2) densely haired and broad; fCu located slightly beyond the basal section of Rs. Hypopygium (Plate 2, fig. 13) setigerous with small setæ; ultimate sternite subrectangular, its caudal incision angulated in U-shape and its infolded mesocaudal thickening deeply U-shaped; cerci broad, subtriangular, extended caudad; two spermatothecæ, spheroid and hyaline. Other structures of the head, thorax, legs, and wings as in the male.

Habitat.—*Boodlea* tide-pool, between tide marks, Japan.

Holotype.—Male; Seto, Wakayama Prefecture; August 29, 1931.

Allotopotype.—Female; August 29, 1931.

Paratopotypes.—Males and females; August 30 and 31, 1930, and August 10 to 31, 1931.

Type specimens.—Alcoholic; deposited in the entomological laboratory, Kyoto Imperial University and the British Museum; collected by M. Tokunaga.

This species is related to *T. maritimus* Edwards, but distinctly differs in the position of fCu, which is located just below the basal section of Rs, the presence of the hypopygial appendage 1_b of the male, and the short subtriangular cerci of the female. In the related species fCu is located far beyond the basal section of Rs, the appendage 1_b is wanting, and the cerci are long and pointed.

TANYTARSUS PONTOPHILUS sp. nov.

The adults of this species swarm very close to the water in the concavities of rocks which are formed by the wave action and which become submerged at full tide. The flies brave the sprays of water and take care of themselves agilely against the breaking waves. The immature forms are found on the algal matting of the flat rocky shore below the high-tide mark.

Male.—Body 1.7 to 1.8 millimeters and wing 1.2 to 1.3 millimeters in length. Thorax brown, with dark brown dorsal stripes. Abdomen yellowish, the tip slightly brown.

Eyes bare, reniform, widely separated from each other; distance between them being greater than the vertical length of the eye (23 : 17). Antennæ 14-segmented; scape dark brown, without sensory pores and setæ; A. R. about 0.4 (34 : 81); distal joint as long as the preceding four joints taken together, with two apical setæ. Maxillary palpi with four distinct joints

(34 : 18 : 13 : 5); distal joint slightly longer than the preceding two joints taken together. Clypeus with about fifteen long setæ. Frontal tubercles obsolete.

Pronotum reduced, not visible from above, without setæ. Præscutum produced forwards over the head, provided with three longitudinal rows of about twelve to fourteen small erect setæ. Supra-alar setal group always with three setæ. Scutellum pale brown, with two long median and four short lateral setæ.

Hypopygium (Plate 1, fig. 8) provided with the ordinary number of appendages. Anal point not thickened, being represented only by a membranous projection which is provided with two short apical setæ. Styles straightly extended caudad, suddenly narrowed at the tip; coxites large, each provided with four short but stiff setæ on the ventromesal margin. Appendage 1 subrectangular from above, provided with several minute setæ on its dorsal side; 1_a pointed, quite bare, slightly longer than appendage 1; appendage 2 extended at the middle of the style, not distinctly broad, almost straight, crowned with short curved setæ, with a few small setæ on the ventromesal edge of the stem; appendage 2_a slender, provided with a tuft of simple hairs on the distal part.

Legs pale brownish yellow; forelegs each with a fixed tibial spine, which is almost half as long as the diameter of the tibia itself; middle and hind tibiæ each with two combs; combs widely separated from each other, occupying about one-third of the circumference of the tibia, provided with unequal spurs, one on each comb; the longer one nearly twice as long as the comb itself, the other slightly longer than the comb; L. R. about 1.5. Claws slender, unserrated; empodium slender and slightly shorter than the claw; pulvilli distinct, subequal in length to the empodium, covered with minute slender hairs.

Wings (Plate 1, fig. 3) hyaline under transmitted light, without any markings; macrotrichiæ completely wanting on the membranous area; anal angle atrophied; squama bare. Vein R_{4+5} almost straight, ending on the level as the tip of M_{3+4}, about twice as long as R_1; r-m very short and subequal to the basal section of Rs; base of fCu located below the base of Rs; 1A nearly straight, beyond the base of fCu being atrophied before the wing margin.

Female.—Body subequal to or slightly shorter than that of the male; wings broader than but subsequal in length to those of the

male. General appearance far paler than in the male. Eyes similar to those of the male in shape, distance between them greater than in the male and very slightly more than the vertical length of the eye (10 : 9). Maxillary palpi 4-segmented (33 : 21 : 13 : 5); distal joint subequal in length to the preceding two joints taken together. Antennæ 5-segmented; distal joint elongated, with a small apical seta, slightly longer than the preceding two joints taken together (27 : 11 + 11); each of the proximal three fusiform joints of the flagellum with five long setæ and two trichoid sensory organs; second proximal joint shallowly constricted at middle. Wings (Plate 1, fig. 4) scantily haired only on the distal parts of cells R_5, M_2, and along a longitudinal line on cell R_5; r-m twice as long as the basal section of Rs, R_{4+5} slightly curved along the costal margin. Hypopygium (Plate 2, fig. 14) covered with minute setæ and without long setæ excepting several long setæ on the ultimate sternite; ultimate sternite elongated, subpentagonal in shape and pointed at the tip, with three pairs of strong setæ on the caudal margin; caudal incision represented only by a shallow U-shaped ental thickening; cerci long, not pointed sharply, five times as long as wide, conspicuously extended caudad far beyond the caudal tip of the ultimate tergite; spermatothecæ two, quite spherical and hyaline. Other characters of the head, thorax, legs, and wings as in the male.

Habitat.—Rocky flat seashore between the tide marks, Japan.

Holotype.—Male; Seto, Wakayama Prefecture; June 30, 1930.

Allotopotype.—Female; June 30, 1930.

Paratopotypes.—Males and females; August 13 and 30, 1930.

Type specimens.—Alcoholic; deposited in the entomological laboratory, Kyoto Imperial University and the British Museum; collected by M. Tokunaga.

This species is allied to *T. maritimus* Edwards, but distinguishable by the following structures: The ultimate joint of the male antenna longer than the preceding three joints taken together, L. R. about 1.5, wings of the male without macrotrichiæ on the membranous area, and fCu of the wing located just below the basal section of Rs.

TANYTARSUS MAGNIHAMATUS sp. nov.

This fly is found swarming low over the flat rocky shore, thinly covered with the algal matting and sand, of calm bays at ebb tide. Many females were also collected by a light trap ashore.

Male.—Body about 2.1 millimeters in length; uniformly yellowish white and sometimes with slightly brownish dorsal stripes.

Eyes bare, fairly broad, reniform, distinctly separated from each other; distance between them on the dorsal side being subequal to or very slightly narrower than the vertical length of the eye. Antennæ 14-segmented; distal joint provided with three short apical setæ, as long as the preceding five or six joints taken together; A. R. about 0.5. Maxillary palpi with four distinct joints (38 : 28 : 23 : 8), distal joint shorter than the preceding two joints taken together. Pronotum reduced; præscutum produced forwards over the head; supra-alar setal group provided with three setæ; scutellum provided with six large median and two short lateral setæ.

Hypopygium (Plate 1, fig. 9) distinctly broad laterad; ultimate tergite also broad laterad and narrow longitudinally, without a thickened anal point but with a smooth, blunt, membranous, anal projection, scantily covered with short setæ on the meson; coxites broad dorsoventrad, extending caudodorsad; styles also broad dorsoventrad, extending caudad, with strong but short setæ on the dorsal margin; appendage 1 very small, not projected mesad, its dorsal side setigerous with many short setæ; 1_a fingerlike, with three minute setæ on its distal knob: 1_b located over 1_a or distad of 1, quite smooth, membranous, varying in size in different individuals; 2 distinctly broad dorsoventrad, crowned with conspicuous recurved setæ; 2_a very large, extended nearly as far caudad as 2, setigerous with fine slender hairs over most of its surface excepting only on its base.

L. R. about 1.5; foreleg with one distinct fixed tibial spine which is as long as the diameter of the tibia itself; middle and hind legs each with two tibial combs; combs occupying about two-thirds of the circumference of the tibia, distinctly separated from each other, with one spur on each comb; two spurs on one leg unequal in length to each other; longer one is nearly thrice and the other twice and half as long as the comb itself. Claws simple, empodium slender, setigerous, with very minute hairs, slightly shorter than the claw; pulvilli distinct, subequal in length to the empodium, broad distad, with many long hairs on the distal part.

Wings (Plate 1, fig. 5) about 0.9 to 1 millimeter in length, hyaline under transmitted light, without markings, distinctly haired with short macrotrichiæ over most of the membranous area; anal

angle fairly developed; squama bare. Vein R_{4+5} twice as long as R_1, curved along the costal margin, ended slightly beyond the level of the tip of M_{3+4}; fCu located just below r-m; r-m subequal in length to the basal section of Rs; 1A almost straight, not beyond the base of fCu.

Female.—Body about 1.9 millimeters in length. Antennæ 5-segmented (31 : 14 : 14 : 24 : 13); distal joint of the flagellum slightly longer than the preceding two joints taken together, with two small apical setæ; proximal second joint constricted distinctly at middle. Wings (Plate 1, fig. 6) larger, comparatively broader and more densely haired than those of the male, measuring about 1.6 to 1.7 millimeters in length. Cerci (Plate 2, fig. 15) extended caudad, elongated, somewhat rhombic in shape, about two and one-half times as long as width of the proximal part, covered with small setæ on the entire surface; ultimate tergite bluntly projected caudad, also covered with small setæ; ultimate sternite subrectangular in shape, truncated at its distal margin, somewhat narrow caudad, bearing on the caudal margin about eight long setæ which are extended as far as the tip of the cerci, scantily haired on its distal half, its caudal incision incomplete and represented by a U-shaped ental thickening. Other structures of the head, thorax, legs, and wings as in the male.

Habitat.—Rocky flat seashore on the tidal zone, Japan.

Holotype.—Male; Seto, Wakayama Prefecture; June 24, 1930.

Allotopotype.—Female; June 24, 1930.

Paratopotypes.—Males; June 24, 1930.

Type specimens.—Alcoholic; deposited in the entomological laboratory, Kyoto Imperial University and the British Museum; collected by M. Tokunaga.

This species is easily distinguishable from the allied species by the exceedingly large appendage 2_a of the male. It is somewhat related to *T. halophilæ* Edwards but differs in the possession of the characteristic hypopygial appendages 1, 1_a, and 1_b of the male and the long terminal joint of the antenna of the male.

TANYTARSUS PELAGICUS sp. nov.

This fly was collected from the same habitat as *T. pontophilus*.

Male.—Body about 1.8 to 1.9 millimeters and wings about 1.2 millimeters in length; thorax brown, with dark brown dorsal stripes; abdomen and legs yellowish; hypopygium slightly brown; general impression setigerous.

Eyes bare, reniform, not widely separated from each other, distance between them on the dorsal side being slightly less than

the vertical length of the eye (50 : 75). Antennæ 14-segmented; scape dark brown; distal joint with an apical seta, as long as the preceding five joints taken together; A. R. about 0.4 (13 : 30). Maxillary palpi distinctly 4-segmented (34 : 23 : 23 : 7); distal joint far shorter than the preceding two joints taken together. Clypeus provided with many long setæ.

Pronotum reduced, not visible from the dorsal aspect. Præscutum produced forwards over the head, provided with several erect setæ on its cephalic part besides the three longitudinal rows of setæ; supra-alar setal group represented always by a single seta. Scutellum pale brown, provided with two long median and four short lateral setæ.

Abdomen slender with many long setæ. Hypopygium (Plate 2, fig. 12) also provided with many long setæ and slightly brown in color; ultimate tergite provided with thickened anal point, large V-shaped thickening and scantily setigerous with long setæ between the V-shaped thickening; coxites broad, setigerous with very long setæ and each with three stiff setæ on the thickened ventromesal margin; styles also setigerous, extended caudodorsad, being slightly bent caudad at its tip; appendage 1 broad, subtriangular, with about five short setæ, extended mesad at its tip; 1_a quite smooth, clawlike, slightly extended mesad beyond 1; 2 comparatively broad, crowned with many short curved setæ only at its tip, extending caudad at the middle of the style; 2_a long slender, extending caudad as far as the tip of the coxite, provided with long, soft, simple hairs on its entire surface.

Foreleg provided with a simple fixed tibial spine; posterior four legs each with two tibial combs which occupy about two-thirds of the circumference of the tibia; each comb with a single accessory spur which is not longer than twice the comb itself; L. R. about 1.3 (4 : 3); pulvilli setigerous with short hairs, slightly shorter than the claw; empodium slender, subequal in length to the pulvilli.

Wings (Plate 2, fig. 10) hyaline under transmitted light, without markings, scantily haired with small macrotrichiæ on the distal region of the cells R_2, M_2, and M_4 and on the veins R, Cu, and 1A, and the wing margin; anal angle almost atrophied; squama bare. Vein R_{4+5} ending on the level of the tip of M_{3+4}, slightly curved along the costal margin, about twice as long as R_1 (43 : 23); basal section of Rs slightly shorter than r-m; fCu narrow, located just below the basal section of Rs; M_{3+4} and Cu_1 almost straight; 1A reaching the base of fCu.

Female.—Body far shorter than that of the male, about 1.5 to 1.7 millimeters in length; general appearance far paler than in the male; dorsal stripes of the præscutum and the postscutellum slightly brown in color. Antennæ 6-segmented (10 : 10 : 10 : 10: 16: 9) ; scape very small; distal four joints subequal in shape and size to each other; distal joint with only one short apical seta; proximal second joint very slightly constricted at middle. Maxillary palpi segmented, with four distinct joints (32 :21 : 16 : 5) ; distal joint slightly shorter than the preceding two joints taken together; second joint slightly shorter than the third (in the male they are subequal in length to each other). Wings (Plate 2, fig. 11) about 1.1 millimeters in length, comparatively broad, densely covered with macrotrichiæ. Hypopygium (Plate 2, fig. 16) covered with long setæ; ultimate sternite broad, its caudal incision large but shallow, V-shaped and its caudomesal thickening large and U-shaped; cerci small, not extended caudad but distinctly elongated cephalad and slightly folded mesad at the ventral margin; spermatothecæ small, spheroid, two in number. L. R. 1.2 to 1.3. Other structures of the head, thorax, legs, and wings closely similar to those of the male.

Habitat.—Rocky flat seashore under the high tide mark, Japan.

Holotype.— Male; Seto, Wakayama Prefecture; June 17, 1930.

Allotopotype.—Female; June 17, 1930.

Paratopotypes.—Males; June 17, 1930.

Type specimens.—Alcoholic; deposited in the entomological laboratory, Kyoto Imperial University and the British Museum; collected by M. Tokunaga.

Both sexes of this species resemble *T. magnihamatus* but identifiable distinctly by the structures of the hypopygium: anal point of the ultimate tergite of the male thickened and pointed and caudal incision of the ultimate sternite of the female wanting, while in the allied species the anal point is reduced and the caudal incision is present.

ILLUSTRATIONS

PLATE 1

FIG. 1. *Tanytarsus boodleæ* sp. nov., male, wing.
2. *Tanytarsus boodleæ* sp. nov., female, wing.
3. *Tanytarsus pontophilus* sp. nov., male, wing.
4. *Tanytarsus pontophilus* sp. nov., female, wing.
5. *Tanytarsus magnihamatus* sp. nov., male, wing.
6. *Tanytarsus magnihamatus* sp. nov., female, wing.
7. *Tanytarsus boodleæ* sp. nov., male hypopygium, dorsal aspect, with appendage 2a.
8. *Tanytarsus pontophilus* sp. nov., male hypopygium, dorsal aspect, with appendage 2a.
9. *Tanytarsus magnihamatus* sp. nov., male hypopygium, dorsal aspect.

PLATE 2

FIG. 10. *Tanytarsus pelagicus* sp. nov., male, wing.
11. *Tanytarsus pelagicus* sp. nov., female, wing.
12. *Tanytarsus pelagicus* sp. nov., male hypopygium, dorsal aspect, with appendage 2a.
13. *Tanytarsus boodleæ* sp. nov., female, ultimate sternite, ventral aspect, and cercus, lateral aspect.
14. *Tanytarsus pontophilus* sp. nov., female, ultimate sternite, ventral aspect, and cercus, lateral aspect.
15. *Tanytarsus magnihamatus* sp. nov., female, ultimate sternite, ventral aspect, and cercus, lateral aspect.
16. *Tanytarsus pelagicus* sp. nov., female, ultimate sternite, ventral aspect, and cercus, lateral aspect.

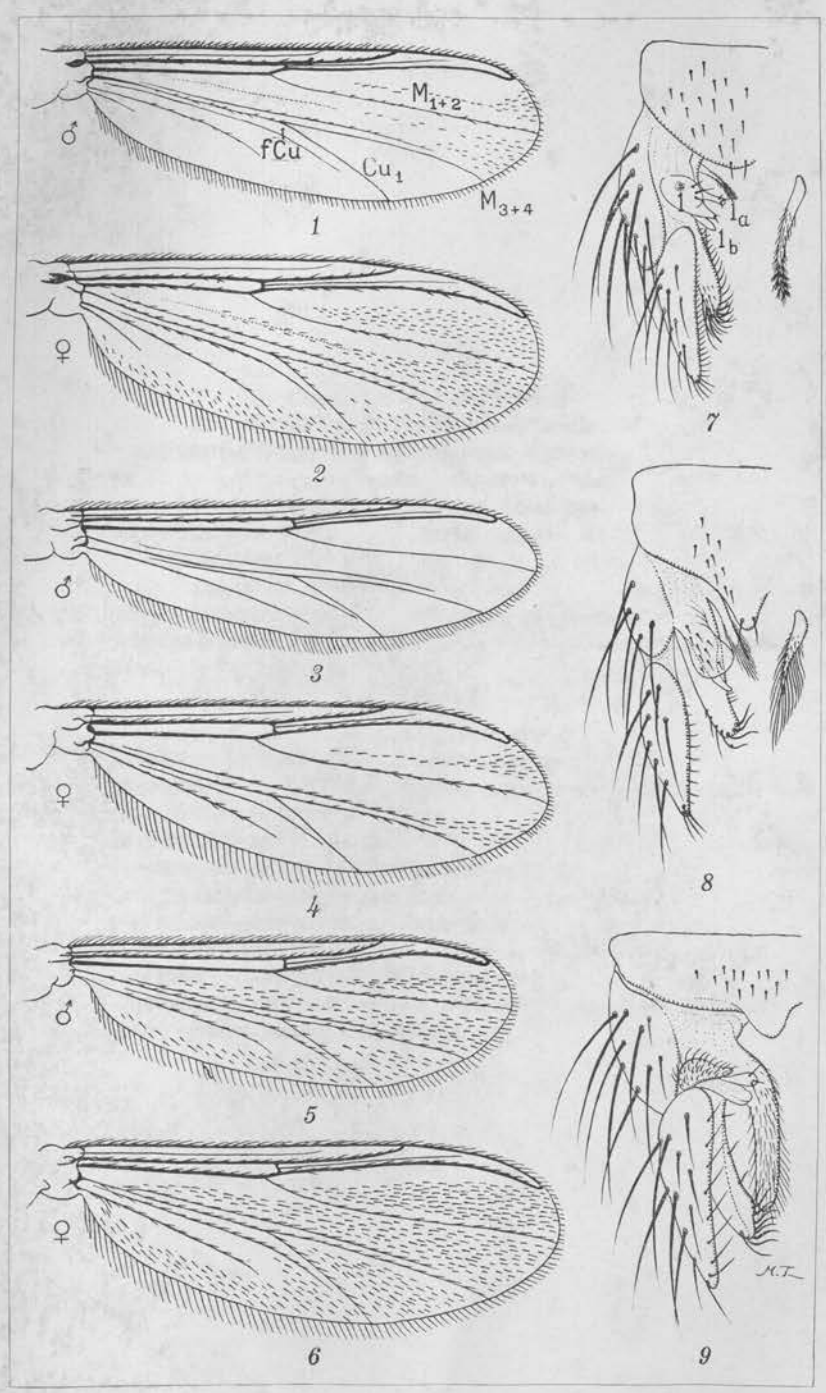

PLATE 1.

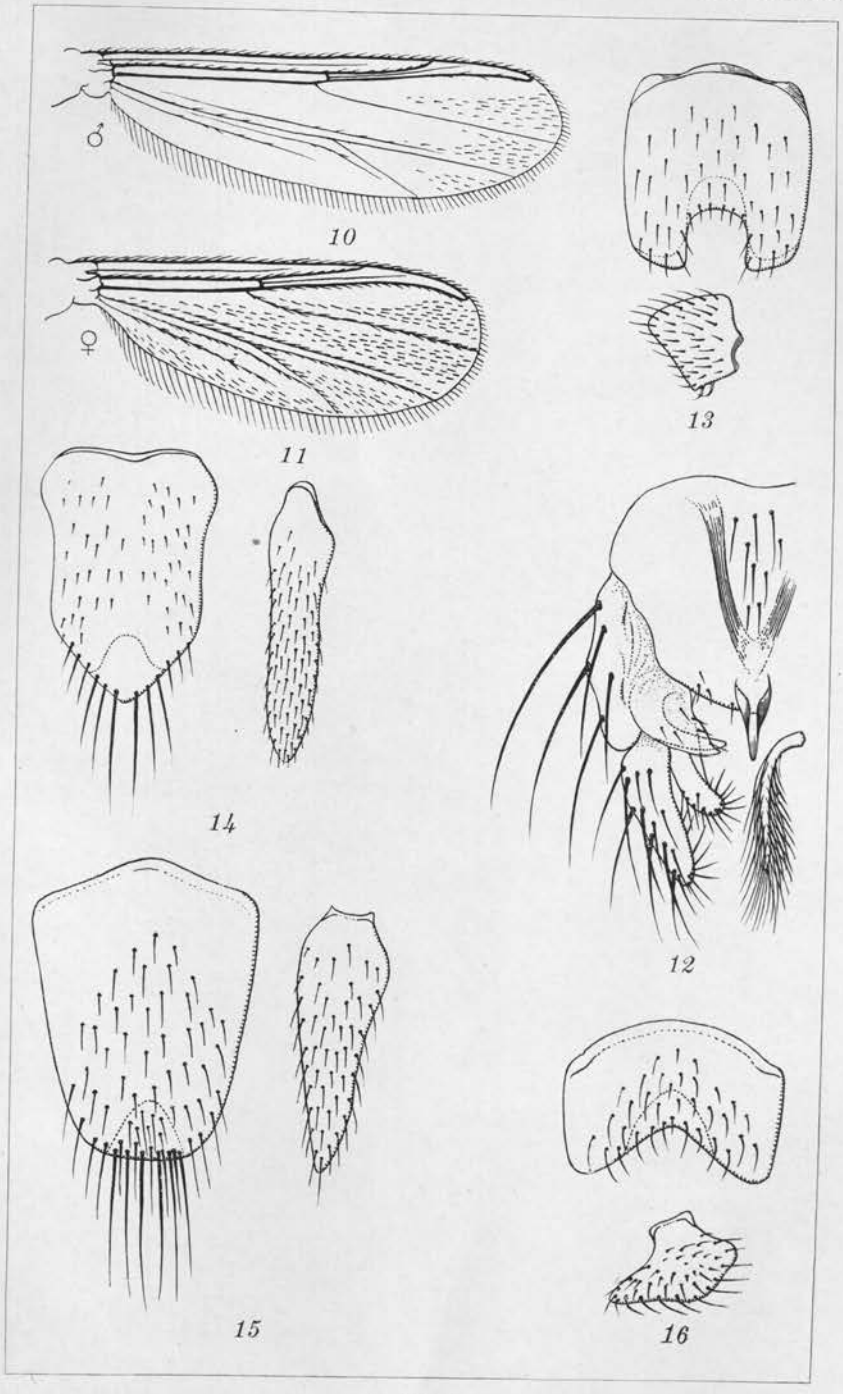

PLATE 2.

NEW OR LITTLE-KNOWN TIPULIDÆ FROM EASTERN ASIA (DIPTERA), XIII[1]

By CHARLES P. ALEXANDER

Of Amherst, Massachusetts

FOUR PLATES

The crane flies discussed at this time are chiefly from Japan, where they were collected by my friends Messrs. Esaki, Hibi, Imanishi, Inomata, Issiki, Machida, Nakamura, Oda, Sakaguchi, Shiraki, Takahashi, and Tokunaga. The smaller but highly important series from China were taken on Mount Omei, Szechwan, by the Reverend Mr. Franck. I wish to express my deepest thanks to all of the gentlemen above mentioned for this continued interest in developing our knowledge of the Tipulidæ of the Eastern Palæarctic region. The types of the novelties are preserved in my collection.

In accordance with a policy adopted in earlier parts under this general title, detailed lists of the Tipulidæ of certain mountainous areas in Honshiu, Japan, are here supplied. It is only by means of such lists that our knowledge of distribution of the Japanese crane flies can make material progress.

Mount Shirouma (Mount Hakuba, or White Horse Mountain), in the alpine country between the Provinces of Echiu, Echigo, and Shinano, August 8, 1931 (J. Machida and T. Nakamura).

Dolichopeza (Nesopeza) geniculata (Alex.).
Tipula (Schummelia) bidenticulata sp. nov.
Tipula (Acutipula) bubo Alex.
Tipula depressa Alex.
Tipula nigrosignata Alex.
Tipula verecunda Alex.
Cylindrotoma japonica Alex.
Limonia (Limonia) euphileta Alex.
Limonia (Limonia) fusciceps Alex.
Limonia (Limonia) karafutonis Alex.
Limonia (Limonia) neoindigena Alex.
Limonia (Limonia) pullata Alex.
Limonia (Limonia) subnubeculosa Alex.

[1] Contribution from the entomological laboratory, Massachusetts State College.

Limonia (*Limonia*) *tanakai* Alex.
Limonia (*Dicranomyia*) *immodestoides* (Alex.).
Pedicia (*Pedicia*) *brachycera* Alex.
Pedicia (*Pedicia*) *subtransversa* Alex.
Dicranota (*Dicranota*) *nippoalpina* Alex.
Epiphragma (*Epiphragma*) *subfascipennis* Alex.
Limnophila (*Tricholimnophila*) *brevirama* Alex.
Limnophila subnemoralis Alex.
Erioptera (*Erioptera*) *juvenilis* Alex.
Ormosia machidana sp. nov.
Ormosia nantaisana Alex.
Molophilus nakamurana sp. nov.

Mount Kiyozumi, Bōsō Peninsula, Kāzusa, altitude 380 meters, May 5, 1931 (*Bunkichi Oda*).

Dolichopeza (*Nesopeza*) *tarsalis* (Alex.).
Tipula (*Nippotipula*) *coquilletti* End.
Tipula (*Schummelia*) *ecaudata* Alex.
Limonia (*Limonia*) *anthracina* Alex.
Limonia (*Limonia*) *euphileta* Alex.
Limonia (*Limonia*) *japonica* Alex.
Dicranota (*Rhaphidolabis*) *consors* Alex.
Limnophila (*Prionolabis*) *odai* sp. nov.
Limnophila (*Tricholimnophila*) *flavella* Alex.
Molophilus trifilatus Alex.

Mount Mitake, Musashi, altitude to 700 meters, May 10, 1931 (*Bunkichi Oda*).

Cylindrotoma japonica Alex.
Triogma kuwanai (Alex.).
Phalacrocera mikado Alex.
Limonia (*Limonia*) *euphileta* Alex.
Limonia (*Dicranomyia*) *pseudomorio* (Alex.).
Limonia (*Geranomyia*) *multipuncta* (Alex.).
Pedicia (*Tricyphona*) *optabilis* (Alex.).
Ula succincta sp. nov.
Limnophila (*Tricholimnophila*) *pilifer* Alex.
Ormosia confluenta Alex.

TIPULINÆ

DOLICHOPEZA (OROPEZA) INOMATAI sp. nov. Plate 1, fig. 1; Plate 2, fig. 25.

General coloration of mesonotum polished cinnamon-brown; legs brown, tarsi paling to obscure yellow; abdomen bicolorous, the bases of segments dark brown, the apices obscure yellow; male hypopygium with the median area of tergite produced into a bispinous or weakly trispinous plate; lateral arms of tergite densely set with microscopic recurved spinulæ; inner dististyle with very long, angularly bent setæ near outer end.

Male.—Length, 9 to 10 millimeters; wing, 9.5 to 11.

Female.—Length, about 11 millimeters; wing, 10.5.

Frontal prolongation of head brown; palpi brownish black. Antennæ with scape and pedicel yellow; flagellum black. Head pale brown, passing to yellowish on frontal portion.

Mesonotal præscutum polished cinnamon-brown, the posterior sclerites somewhat darker. Halteres pale, the knobs darkened. Legs dark brown, the femoral bases and outer tarsal segments more yellowish. Wings (Plate 1, fig. 1) with a pale brownish tinge, the oval stigma darker brown, conspicuous, preceded and followed by cream-colored areas; a pale obliterative streak across cell 1st M_2; veins pale brown.

Abdomen bicolorous, the bases of the segments dark brown, the apices somewhat more broadly obscure yellow; subterminal segments more uniformly darkened; hypopygium obscure yellow. Male hypopygium (Plate 2, fig. 25) with the caudal margin of tergite, 9*t*, produced in median portion into two subacute triangular points, one on either side of median line; on ventral surface a smaller median point, so that in certain aspects this tergal plate appears tridentate; lateral arms of tergite expanded, with carinæ, the cephalic face of club with abundant microscopic pale spinulæ that are more or less recurved. Outer dististyle, *od*, relatively short, with long setæ. Inner dististyle, *id*, slender, clothed with conspicuous setæ, those near the base small, those before apex long and angularly bent and thickened at near midlength, the apical setæ again straight and spiniform. Ædeagus, *a*, simple. Gonapophyses appearing as pale setiferous lobes.

Habitat.—Japan (Honshiu).

Holotype, male, Kyusho Mountain, Hôki, June 13, 1930 (*Hibi*). Allotopotype, female. Paratopotypes, 2 males.

This interesting new *Oropeza* is named in honor of my friend Prof. Shujiro Inomata, to whom I am indebted for many interesting Tipulidæ from Tottori. The only described Japanese member of the subgenus that is at all similar to the present fly is *D.* (*O.*) *bispinula* (Alexander), likewise from the mountains of Honshiu. The hypopygium of the latter fly is very different, the outer ends of the lateral tergal arms being very large and smooth, while the setæ of the inner dististyle are short and simple.

MACGREGOROMYIA BREVICULA sp. nov. Plate 1, fig. 2; Plate 2, fig. 26.

General coloration of thorax brownish black; antennæ (male) elongate, exceeding one-half the length of the body; halteres yellow, the knobs black; legs black; wings grayish subhyaline, the

costal region more yellowish; stigma and a narrow seam along cord dark brown; Rs very short, less than the arcuated r-m, the latter connecting with the basal section of R_{4+5}; cell 1st M_2 very small; abdominal segments bicolorous, dark brown basally, the apices broadly yellow.

Male.—Length, about 10 millimeters; wing, 11.5; antenna, about 5.8.

Frontal prolongation of head buffy; palpi black, the terminal segment exceeding in length the remainder of organ. Antennæ (male) relatively long, as shown by measurements; scape and pedicel buffy yellow; flagellum black; flagellar segments long-cylindrical, the basal enlargements very slightly developed, with tiny verticils that are about as long as the diameter of the segment. Head brown; anterior vertex more grayish.

Mesonotum chiefly blackish, the præscutal interspaces paler. Pleura dark-colored, crushed in the unique type. Halteres elongate, yellow, the knobs black. Legs black. Wings (Plate 2, fig. 2) grayish subhyaline, the prearcular and costal regions slightly more yellow; stigma oval, dark brown; a narrow but conspicuous dark seam along cord; still narrower dark borders to veins Cu and 2d A; posterior wing margin extensively but narrowly bordered by brown; veins dark brown, C, Sc, and R more yellowish. Venation: Rs very short, transverse, subequal to basal section of R_{4+5} and much shorter than the arcuated r-m; r-m connecting with R_{4+5} and not directly with Rs, as in the other species of genus; R_{1+2} preserved, parallel to free tip of Sc_2; cell 1st M_2 very small, narrowed outwardly; m-cu just beyond fork of M.

Abdomen with the basal segment dark brown; second tergite chiefly light yellow with a brown transverse ring just beyond midlength; succeeding tergites brown basally, their apices broadly yellow; segments eight and nine uniformly dark brown. Male hypopygium (Plate 2, fig. 26) with the tergite, 9*t*, notched medially, as in the genus. Outer dististyle, *od*, a long, slender, pale lobe clothed with conspicuous setæ. Inner dististyle, *id*, with the posterior or "heel" portion prolonged into an obtuse setiferous lobe. Ædeagus, *a*, simple.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, altitude 3,500 feet, August 16, 1931 (*Franck*).

Macgregoromyia brevicula differs from the four species of the genus hitherto described in having r-m connecting with vein R_{4+5} rather than with Rs before the fork of the latter. The group certainly appears to belong to the subtribe Dolichopezaria,

in the vicinity of *Dolichopeza* Curtis and *Scamboneura* Osten Sacken.

TIPULA (SCHUMMELIA) BIDENTICULATA sp. nov. Plate 1, fig. 3; Plate 2, fig. 27.

Belongs to the *continuata* group; general coloration yellow, conspicuously variegated with dark brown, including three præscutal stripes; antennal flagellum weakly bicolorous; wings with the ground color strongly infumed, variegated by dark brown and cream-colored areas; male hypopygium with the caudal end of the ninth tergite shallowly emarginate; inner dististyle prolonged behind, terminating in two acute blackened points.

Male.—Length, about 13 millimeters; wing, 14.

Female.—Length, about 12 to 14 millimeters; wing, 14 to 15.

Frontal prolongation of head testaceous-yellow; nasus elongate; palpi black. Antennæ with scape and pedicel light yellow; flagellum weakly bicolorous, brown, the basal enlargement of each segment a little darker than the remainder; antennæ (male) relatively short, if bent backward extending to the wing root or shortly beyond. Head yellow, most evident as a broad median stripe extending the whole length, bordered on either side by dark brown; posterior orbits very narrowly obscure yellow.

Pronotum broadly yellow medially, brown laterally. Mesonotal præscutum with the ground light yellow, with three conspicuous dark brown stripes, the median one feebly split by a capillary reddish line; lateral stripes with anterior ends approaching the median one and the interspaces here suffused with brown, though conspicuously light yellow behind; humeral region of præscutum broadly of the ground color; scutum, scutellum, and mediotergite broadly yellow medially, dark brown laterally, the scutellum more testaceous and with a faintly indicated dark median vitta. Pleura yellow, conspicuously variegated with dark brown on ventral anepisternum, sternopleurite, and meron; posterior sclerites of pleura chiefly yellow. Halteres obscure yellow, the knobs clearer yellow. Legs with the coxæ yellow, slightly darkened at bases; trochanters yellow; femora obscure yellow, the tips narrowly brownish black; tibiæ dark brown, the bases restrictedly pale, the tips narrowly blackened; tarsi black; claws (male) slender, with basal tooth. Wings (Plate 1, fig. 3) with the ground color strongly infumed, variegated by darker brown and cream-colored areas; darker areas chiefly evident as the stigma and as a broad seam on m-cu and distal section of Cu_1; vein 2d A narrowly seamed with brown; the creamy areas appear as a narrow obliterative band along cord; basal half of cell

R_2; areas near outer end of cell M, bases of cells Cu and 1st A, outer end of cell 1st A, adjoining vein 2d A, and along outer end of vein 1st A. Squama naked. Venation: R_{1+2} pale but preserved, without trichia on distal third or more.

Abdominal tergites obscure yellow, the first and base of second clearer yellow; succeeding tergites more obscure, the margins pale; hypopygium with the tergite dark brown, the sternites more brownish yellow. In the female, the incisures are more conspicuously light yellow. Male hypopygium (Plate 2, fig. 27) with the tergite, 9*t*, separated from the sternite, 9*s*; basistyle entirely fused with sternite. Ninth tergite, 9*t*, with the caudal margin very broadly and evenly emarginate, on ventral surface more sclerotized. Outer dististyle, *od*, a pale subcylindrical rod, gradually narrowed to the obtuse apex, clothed with elongate setæ. Inner dististyle, *id*, produced behind into a bispinous point. Eighth sternite, 8*s*, unarmed.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Shirouna, Shinano (Japanese Alps), August 8, 1931 (*Machida and Nakamura*). Allotopotype, female. Paratopotype, female.

The Japanese species of *Schummelia* now total more than a dozen and may be arranged in three groups. Of these, the *macrotrichiata* group includes *macrotrichiata* Alexander, *sparsiseta* Alexander, and *sparsissima* Alexander, separated by the presence of macrotrichia in the outer cells of the wing. The *variicornis* group includes *acifera* Alexander, *insulicola* Alexander, *insulicola fuscicauda* Alexander, *variicornis* Schummel, var., and presumably *nikkoensis* Alexander, still known only from the female sex. The remaining species fall in the *continuata* group, with *ecaudata* Alexander, *imanishii* sp. nov., *jocosipennis* sp. nov., *nipponensis* Alexander, *querula* Alexander, and the present species. *Tipula bidenticulata* is closest to *nipponensis* in the caudal extension of the inner dististyle of the male hypopygium, but the conformation of the styli is quite distinct.

TIPULA (SCHUMMELIA) JOCOSIPENNIS sp. nov. Plate 1, fig. 4; Plate 2, fig. 28.

Belongs to the *continuata* group; antennal flagellum black; mesonotum gray, the præscutum with three darker gray stripes; thoracic pleura variegated with yellow and brownish gray; wings with the ground color whitish, the prearcular and costal regions light yellow, the disk heavily patterned with brown, most conspicuously on the wing tip and along veins m-cu and distal section of Cu_1; male hypopygium with the inner dististyle mitten-

shaped, the cephalic edge at near midlength produced into a blackened point.

Male.—Length, about 10 to 11 millimeters; wing, 13 to 14.

Female.—Length, about 13 to 14 millimeters; wing, 14 to 15.

Frontal prolongation of head chiefly buffy yellow; palpi pale yellow, the outer segment passing into brown. Antennæ with the scape and pedicel light yellow; flagellum black; antennæ (male) relatively long, if bent backward extending about to root of halteres. Head with front and anterior vertex pale yellow, the remainder of vertex brownish gray. Mesonotum gray, with three darker gray stripes, the lateral pair somewhat darker, the median stripe more or less split on posterior portion; scutal lobes darkened; scutellum pale brown, with a more blackish median vitta; mediotergite dark plumbeous gray. Pleura yellow, variegated with brownish gray on anepisternum, sternopleurite, and meron. Halteres chiefly pale yellow. Legs with the coxæ and trochanters yellow; remainder of legs broken. Wings (Plate 1, fig. 4) with the ground color whitish, the prearcular and costal regions light yellow; stigma dark brown, very conspicuous; paler brown areas on disk, the most distinct being the wing tip and broad seams on m-cu and distal section of Cu_1; less evident washes on anterior cord, in outer end of cell 1st A, and as a marginal seam at end of vein 2d A; cells R and M vaguely suffused with pale brown, leaving an extensive ground area before outer end of latter; obliterative areas involving end of Rs, basal sections of M_{1+2} and M_3; veins brown, paler in the obliterative areas, more yellowish in the flavous costal portion. Venation: As in the subgenus; Rs a little longer than m-cu, the latter connecting with M_{3+4} shortly before its fork.

Abdominal tergites yellow, with a nearly continuous brownish black to dark brown median stripe, narrowly interrupted at the caudal margins of the intermediate segments; segments seven to nine, inclusive, more uniformly blackened; sternites chiefly yellow, the seventh and eighth segments blackened. Male hypopygium (Plate 2, fig. 28) with the tergite, 9*t*, entirely distinct from the sternite-basistyle, 9*s–b*, the two latter entirely fused. Median region of sternite broadly membranous. Ninth tergite, 9*t*, black, the caudal margin with a broadly rounded emargination, the lateral lobes obtuse. Outer dististyle, *od*, pale, elongate-cylindrical. Inner dististyle, *id*, mitten-shaped, the cephalic edge at near midlength produced into a blackened point.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Ohdai, Yamato, altitude 2,600 feet, June 5, 1930 (*Sakaguchi*). Allotopotype, female. Paratopotypes, 3 of both sexes.

Tipula (*Schummelia*) *jocosipennis* differs from *T.* (*S.*) *ecaudata* Alexander and *T.* (*S.*) *querula* Alexander, which appear to be the nearest allies, in the more strikingly patterned wings, grayish pattern of the mesonotal præscutum, and the structure of the male hypopygium, especially of the inner dististyle. The pattern of the wing is more like that found in *T.* (*S.*) *macrotrichiata* Alexander, which, however, has distinct macrotrichia in the outer cells of the wing, as discussed at the conclusion of the preceding species. Despite this presence of macrotrichia, the relationship between the members of the *macrotrichiata* and *variicornis* groups is very close, indeed.

TIPULA (SCHUMMELIA) IMANISHII sp. nov. Plate 1, fig. 5; Plate 2, fig. 29.

Belongs to the *continuata* group; allied to *jocosipennis;* mesonotal præscutum obscure yellow, with three opaque dark gray stripes that are indistinctly bordered by blackish; posterior yellow interspaces narrow or suffused with dusky; wings with the ground color creamy, with certain of the veins seamed with darker, the wing tip unclouded; male hypopygium with the inner dististyle produced into a slender subterminal beak.

Male.—Length, about 10 to 11 millimeters; wing, 12.5 to 13.5.

Female.—Length, about 15 millimeters; wing, 14.

Frontal prolongation of head yellow above, abruptly dark brown laterally; nasus distinct; palpi brownish black. Antennæ with scape obscure yellow, a little darker outwardly; pedicel pale yellow; flagellum brownish black; antennæ (male) moderately long, if bent backward extending about to root of halteres. Front and median area of anterior vertex yellow; posterior vertex and sides of anterior vertex weakly infumed.

Mesonotal præscutum obscure yellow, with three opaque dark gray stripes that are indistinctly bordered by blackish; posterior interspaces narrowly yellow to almost obliterated by dusky suffusions; scutum and mediotergite dark gray, each with a narrow median pale line; scutellum obscure yellow, with a capillary brown vitta. Pleura obscure yellow, conspicuously variegated by brownish gray. Halteres dusky, the knobs yellow. Legs with the femora obscure yellow, the tips conspicuously blackened; tibiæ and tarsi dark brown. Wings (Plate 1, fig. 5) with the ground color creamy, the prearcular region and costal cell brighter yellow, cell Sc slightly darkened; restricted obliterative

areas before and beyond stigma and across cell 1st M_2; veins bordered with brown, most heavily and distinctly on m-cu, Cu, and 2d A, the other veins less sensibly darkened. Venation: Cell 1st M_2 small; cell 2d A narrow.

Abdomen with basal five tergites obscure yellow, the lateral portions darkened; remaining segments, including hypopygium, brownish black. Male hypopygium (Plate 2, fig. 29) with the caudal margin of the ninth tergite, 9*t*, broadly and evenly rounded. Inner dististyle, *id*, somewhat of the type of *jocosipennis;* that is, without caudal extension and with a subapical beak; in the present fly, this beak lies farther distad and is distinctly slenderer than the similar beak of *jocosipennis.*

Habitat.—Japan (Honshiu).

Holotype, male, Mount Kurobegoro, Echiu, in subalpine meadow, altitude 7,800 feet, August 8, 1931 (*Imanishi*). Allotopotype, female. Paratopotype, male.

Tipula (*Schummelia*) *imanishii* is respectfully dedicated to the collector, Mr. K. Imanishi, to whom I am indebted for valuable coöperation in studying the Japanese Tipulidæ. The fly needs comparison only with *jocosipennis* sp. nov., differing most evidently in the distinct thoracic coloration, obscure wing pattern, and in the structure of the male hypopygium, notably the position and slenderness of the beak of the inner dististyle.

TIPULA (ACUTIPULA) INTACTA sp. nov. Plate 2, fig. 30.

Belongs to the *fulvipennis* group; allied to *turbida;* antennal flagellum uniformly dark brown; mesonotal præscutum with four brown stripes that are more or less confluent on cephalic portion of sclerite; tips of femora blackened; tarsi chiefly light yellow; wings with the ground color conspicuously darkened, restricting the whitish hyaline areas to a major spot before cord, the extreme bases of the outer medial cells and the usual areas in cells M and Cu; median lobe of ninth tergite of male hypopygium simple.

Male.—Length, about 14 millimeters; wing, 16.5.

Frontal prolongation of head dark colored; nasus distinct; palpi dark, paler at incisures, the terminal segment broken. Antennæ dark brown, terminal segment reduced to a tiny button. Head dark brown.

Pronotum brown. Mesonotal præscutum with four relatively ill-defined brown stripes, all more or less confluent on cephalic portion of sclerite, the capillary pale median vitta well indicated behind; scutum and scutellum chiefly dark brown; medio-

tergite more or less denuded in the unique type, the posterior and lateral portions with a dense golden pollen. Pleura chiefly pale yellow. Halteres long, brown, the extreme base of stem paler. Legs with coxæ greenish yellow; trochanters yellow; femora yellow at bases, passing into brown, the tips conspicuously blackened; tibiæ brown, the tips narrowly darkened; tarsi paling to light yellow, the outermost segments broken; tibial spur formula 1–2–2. Wings with the pattern almost as in *brunirostris* and similar species; costal cell not conspicuously darkened, Sc a trifle more infumed; dark area in cell Cu distinct, placed before midlength of the basal section of Cu_1. All branches of M and distal section of Cu_1 with sparse but evident macrotrichia; squama with a few short setæ.

Basal abdominal segments brown, the caudal margins narrowly paler; outer segments, including hypopygium, more uniformly darkened. Male hypopygium (Plate 2, fig. 30) with the median lobe of the tergite, 9*t*, entire, at apex set with sparse blackened spicules. Outer dististyle, *od*, entirely pale, broad basally, narrowed to the subacute apex. Inner dististyle, *id*, conspicuously tripartite, the two outer lobes with dense groups of erect yellow setæ, the apical lobe much broader and stouter than the others, separated from the intermediate lobe by a shallow rounded notch. Eighth sternite, 8*s*, with the caudal portion narrowed, the apex truncate and set with short setæ that are shortest near the meson; before apex on ventral surface with a median swollen area set with longer yellow setæ.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, altitude 8,500 feet, July 18, 1931 (*Franck*).

The present species differs from *princeps* Brunetti, *shirakii* Edwards, *brunnirostris* Edwards, and other similar allied species in the Oriental and Eastern Palæarctic faunal regions in the simple lobe of the ninth tergite of the male hypopygium. In the latter character, it agrees more closely with a small group of Eastern Palæarctic forms that center about *bubo* Alexander, as *kuzuensis* Alexander and *turbida* Alexander, differing in the wing pattern and details of the male hypopygium.

TIPULA (ACUTIPULA) SUBTURBIDA sp. nov. Plate 1, fig. 6; Plate 2, fig. 31.

Belongs to the *fulvipennis* group; allied to *bubo* and *turbida;* antennæ with scape and pedicel yellow, flagellum dark brown; præscutal stripes ill-defined; wings with a conspicuous dark pat-

tern, the outer half of cell R_5 nearly hyaline; male hypopygium with the median lobe of the ninth tergite simple.

Male.—Length, about 14 millimeters; wing, 16.

Frontal prolongation of head relatively stout, uniformly dark brown; palpi pale brown, terminal segment broken. Antennæ with the scape and pedicel yellow; flagellum dark brown, the basal enlargements of the segments more intense, the outer segments more uniformly darkened; verticils long and conspicuous, a trifle longer than the segments alone. Head dark brown.

Mesonotal præscutum light gray, with four scarcely indicated darker grayish brown stripes; mediotergite with a lighter gray pruinosity. Pleura obscure brownish yellow, the pleurotergite a little darker. Halteres relatively long, brown, the apex of knob paler. Legs with the coxæ pruinose; trochanters obscure yellow; remainder of legs broken. Wings (Plate 1, fig. 6) with a dark pattern that is much as in *turbida;* prearcular region and cells C and Sc dark brown; whitish area before cord more restricted; distal half of cell R_5 nearly hyaline.

Abdominal tergite one chiefly infuscated; succeeding segments light yellow, with a narrow sublateral brown stripe that widens on the third and following segments, the outer portion of organ, including hypopygium, chiefly dark brown. Male hypopygium as in *bubo* and allies, the median lobe of the tergite being simple and weakly spinulose. Eighth sternite with numerous short setæ at caudal end. The chief distinctions between species of the present group are to be found in the conformation and armature of the inner dististyle (Plate 2, fig. 1, *id*). Ninth sternite with a conspicuous brush of yellow setæ lying in the median notch.

Habitat.—China (Szechwan).

Holotype, male, Pehlinting, Mount Omei, altitude 6,000 feet, July, 1931 (*Franck*).

Tipula (*Acutipula*) *subturbida* is allied to *bubo* Alexander and *turbida* Alexander, both of Japan, differing especially in the wing pattern and details of the male hypopygium, especially of the inner dististyle.

TIPULA SAKAGUCHIANA sp. nov. Plate 1, fig. 7; Plate 2, fig. 32.

Allied to *nigrocostata;* antennæ bicolorous, in male, if bent backward, extending about to the second abdominal segment; wing with costal border brownish black, remainder of disk pale brown, variegated by creamy areas; cell M_1 very short-petiolate; male hypopygium with the tergite divided by pale yellowish

membrane, on either side with an acute curved spine; basistyle produced.

Male.—Length, 15 millimeters; wing, 16; antenna, about 6.

Frontal prolongation of head relatively stout, grayish brown; nasus long and slender; palpi brown. Antennæ (male) elongate, but still shorter than in *nigrocostata*, if bent backward extending about to the second abdominal segment; antennæ with scape and pedicel yellowish brown; basal flagellar segments weakly bicolorous, the basal enlargements of the second and succeeding segments dark brown, the apices paler; outer segments more uniformly darkened; verticils stout, not exceeding one-half the length of the segments; terminal segment minute, thimble-shaped. Head brownish gray.

Mesonotal præscutum light gray, with three somewhat darker gray stripes that are narrowly bordered by darker brown, the median stripe with a central vitta of this color on anterior half; posterior sclerites of mesonotum dark gray. Pleura pale buffy gray, variegated with darker gray areas on anepisternum, ventral sternopleurite, and meron; pleura glabrous. Halteres elongate, brownish yellow, the knobs dark brown. Legs with the coxæ whitish; trochanters yellow, remainder of legs broken. Wings (Plate 1, fig. 7) with a faint brown tinge; prearcular region yellow; cells C and Sc brownish black, the color not involving any part of the radial field; stigma slightly paler brown; somewhat more cream-colored areas, as follows: Before stigma; as an incomplete fascia beyond cord and stigma, extending from basal half of cell R_2 through cell 1st M_2; in cell M, on either side of a more dusky area at near midlength of the cell; veins dark brown, the prearcular veins more yellowish. Squama naked; trichia of veins numerous and well-distributed, including all veins beyond cord and on outer ends of principal basal veins. Venation: R_{1+2} entire, rather strongly upcurved; cell M_1 short-petiolate, the petiole being approximately one-half m; m-cu just beyond fork of M_{3+4}, at about one-third the length of cell.

Abdomen with the basal tergites yellow, with a dark brown median stripe that is narrowly interrupted at the caudal margins of the segments, widened on the outer tergites, the eighth segment chiefly infuscated, the ninth tergite again yellow, except for the caudal sclerotized armature; sternites yellow, the caudal margins of the segments narrowly darkened, the eighth sternite uniformly infuscated; hypopygium yellow. Male hypopygium (Plate 2, fig. 32) with the suture between the tergite, 9*t*, and sternite, 9*s*, complete except for about the cephalic fifth. Basi-

style, *b*, entirely separated from sternite, the outer end narrowed and produced to extend to opposite the tips of the inner dististyles, *id.* Ninth tergite, 9*t*, viewed dorsally, entirely divided by pale membrane, the caudal margin on either side with an arched blackened thorn or spine, their tips acute; viewed from the side, the thorns are produced caudad and ventrad into flattened blackened plates; between the two blackened masses on either side is a high, compressed, pale membrane. Eighth sternite slightly sheathing, its apex with longer and more abundant setæ.

Habitat.—Japan (Honshiu).

Holotype, male, Kaisogun, Kii, altitude about 325 feet, August, 1929 (*Sakaguchi*).

I take pleasure in dedicating this beautiful species of *Tipula* to my friend Prof. S. Sakaguchi, who has added materially to our knowledge of the crane flies of the Riukiu Islands and Honshiu. The only near ally of this fly is *T. nigrocostata* Alexander (Kyūshū), which, while very similar in general appearance, differs in the longer, less distinctly bicolorous antennæ, the short cell M_1 of the wings, and the details of the male hypopygium, more especially of the tergite, where the dorsal spines are shorter and the median area is more solidly sclerotized.

TIPULA (VESTIPLEX) SERRIDENS Alexander. Plate 3, fig. 33.

Tipula serridens ALEXANDER, Trans. Am. Ent. Soc. 46 (1920) 18–19.

The type of this interesting fly was a female, taken in the Province of Musashi, Honshiu, in May, 1919. The male remained unknown until a small series was taken on Mount Daisen, Hôki, altitude 3,900 to 5,560 feet, June 7, 1930, by Hibi. The following description is given, since the male differs in several important regards from the female. The ground color of the wings, and especially the costal border, is darker, more brownish than in the holotype female, and the legs are much darker colored.

Male.—Length, about 15 to 16 millimeters; wing, 16 to 17.5.

Frontal prolongation of head dark gray; nasus short and stout; palpi brownish black. Antennæ of moderate length; scape and pedicel yellowish brown to brown; flagellum black; flagellar segments strongly incised to appear binodose. Head light gray, with a capillary brown line.

Mesonotal præscutum clear light gray, with four darker gray stripes that are narrowly but conspicuously bordered by bright brown, broadest and most distinct on the lateral stripes; inter-

mediate stripes wider and contiguous in front, narrowed and gradually divergent behind, not reaching the suture; posterior sclerites of mesonotum chiefly light gray, each scutal lobe with a small lunate mark at cephalolateral corner, immediately behind suture; scutellum with a capillary median brown vitta. Pleura gray; dorsopleural region buffy yellow. Halteres pale, the knobs chiefly yellow, the base of stem slightly darkened. Legs with coxæ light gray; trochanters grayish yellow; femora obscure yellow on slightly more than proximal half, thence passing into dark brown; tibiæ dark brown, the tips slightly darker; tarsi black; tibial spur formula 1–2–2; claws with a small basal tooth. Wings with the ground color rather dark brown, variegated by whitish areas, including an incomplete, rather narrow, cross-band beyond cord, extending from costa to near midlength of cell M_2, including the outer half of cell Sc_2, basal third of R_2, narrow subbasal portions of cells R_3 and R_5 and most of 1st M_2; additional large white areas near outer end of cell M and in bases of Cu and 1st A; cell R_1 before stigma chiefly white; prearcular region clear yellow; cell C brown, Sc more yellowish brown; stigma oval, dark brown; brown clouds at origin of Rs and on anterior cord; veins brown, pale in the obliterative areas. Squama naked. Vein R_{1+2} with about eight trichia, distributed on about the basal half; short trichia on all veins beyond cord, excepting the distal third of R_5. Venation: R_{1+2} entire, both it and R_3 pale at outer end; m about one-half the petiole of cell M_1; m-cu at fork of M_{3+4}.

Abdomen with the basal tergite grayish brown; segments two to four yellow, with a brown median vitta that widens on the outer segments; tergites five to eight black, sparsely pruinose, the lateral margins narrowly pale; sternites five to nine more strongly pruinose; styli of hypopygium yellow. Male hypopygium (Plate 3, fig. 33) with the tergite separated from the sternite. Basistyle embedded in membrane, thus separated from sternite. Ninth tergite, 9*t*, appearing as a chitinized saucerlike structure, the margins smooth; viewed laterally, the inner blackened rim appears higher than the outer margin. Inner dististyle, *id*, relatively slender, with conspicuous setæ. Ventral portion of basistyle produced dorsad and caudad as a slender rod that terminates in an acute blackened point. Eighth sternite unarmed.

Allotype, male, Mount Daisen, Hôki, altitude 4,550 feet, June 7, 1930 (*Hibi*).

There are two distinct ways in which the allotype, or type of the opposite sex from that of the holotype or lectotype, may be selected. It may either be part of the *original series* of specimens and be chosen from such series either by the original author or a subsequent author; or, it may be a specimen quite *apart* from the *original series,* selected at a subsequent date by the original describer of the species or by any later student. Probably far more than one-half of all described insects have been based upon a single or unique type, and according to the first interpretation of the word "allotype," such species could never be represented by a specimen of the opposite sex. In recent years, certain writers have suggested additional type categories to accommodate the second option above listed; that is, the selection of an allotype from material not on hand at the time of the original description of the species. Betrem [2] proposed for such a type the term "allolectotype," not being acquainted with the earlier term "lectoallotype," proposed by Curran two years earlier.[3] In the opinion of the present writer, both of these latter terms are synonyms of the original definition of "allotype," as proposed by Muttkowski.[4] This writer clearly says: "The allotype need not be described by the protologist (first describer); it can be contained in the original as well as any subsequent description by other authors. Thus, if the protolog describes only a holotype male, the first female subsequently described is to be called the allotype." In the light of this clear exposition of what was intended in the original proposal of this term, it would seem that if two distinct terms were required to accommodate the two possibilities above listed it would be necessary to propose a new term for the case where the second sex is described coincidentally with the definition of the holotype. In any case, the present writer intends to continue to use the term "allotype" as was originally intended by the first proposer of the term.

TIPULA QUADRISPICATA sp. nov. Plate 1, fig. 8; Plate 3, fig. 34.

Allied to *tetracantha;* male hypopygium with the outer dististyle broad, narrowed into a long, straight, spikelike point; basal portion of inner dististyle produced into a conspicuous blackened rod that is unequally bispinous at apex.

[2] Treubia 9 supplement (1928) 3.
[3] Can. Entomol. 58 (1926) 311.
[4] Bull. Public Mus. Milwaukee 1 (1910) 10.

Male.—Length, about 16 millimeters; wing, 17.4.

Frontal prolongation of head obscure yellow; nasus conspicuous; palpi light brown, the outer segment darker. Antennæ with the scape and pedicel yellow; flagellar segments brown, the base of each segment obscure yellow, on the first segment including more than one-half the segment, on the remaining segments becoming less in amount, the outer segments uniformly darkened. Head light gray.

Mesonotal præscutum light gray, with four scarcely differentiated darker gray stripes; posterior sclerites of mesonotum gray, the scutellum obscure yellow with a median brown vitta. Pleura clear light gray; dorsopleural region buffy. Halteres pale, the knobs weakly infuscated. Legs with the coxæ sparsely pruinose; trochanters yellow; femora yellowish brown, the tips narrowly blackened; tibiæ brown; tarsi brownish black. Wings (Plate 1, fig. 8) with a strong brownish yellow tinge, cell Sc and prearcular region more yellow; stigma elongate, dark brown; veins dark brown. Obliterative areas very restricted, appearing at end of Rs and adjoining veins, and on basal sections of vein M_{1+2} and M_3, crossing cell 1st M_2. Venation: Petiole of cell M_1 a little more than one-half m.

Basal abdominal tergites yellow, the outer segments becoming dark brown, margined laterally and caudally with pale; sternites yellow. Male hypopygium with the tergite distinct from sternite except about on cephalic sixth. Basistyle fused with sternite except on ventral portion. Ninth tergite (Plate 3, fig. 34, 9*t*) extensive, gradually narrowed outwardly, terminating in two slender, blackened, spinulose lobes that are separated by a broad U-shaped notch. Outer dististyle, *od*, a broad rod that suddenly narrows to a long spikelike point. Inner dististyle, *id*, with the basal portion produced into a blackened rod, its apex unequally bispinous.

Habitat.—Japan (Honshiu).

Holotype, male, Kaisogun, Kii, June, 1930 (*Sakaguchi*).

Tipula quadrispicata is closely allied to *T. tetracantha* Alexander (Honshiu, Shikoku, Kiushu), differing conspicuously in the structure of the tergite and styli. These parts are shown for *tetracantha* (Plate 3, fig. 35) as a basis for comparison between the two species. Both of these flies have a pair of fingerlike lobes pendant from the ninth sternite. The species differ from the other known Japanese species of *Tipula* in having the bases of the individual flagellar segments pale yellow, contrasting with the brown remainder of the segment.

TIPULA CURVICAUDA Alexander. **Plate 3, figs. 36 to 39.**

Tipula curvicauda ALEXANDER, Ann. Ent. Soc. Am. 16 (1923) 72–73.

The type was a male from Kamikohti, Shinano, Honshiu, taken July 13, 1918, by Issiki. Additional material has since come to hand from other parts of the mountains of Honshiu, as follows: One male, Yumoto, Shimotsuke, altitude 4,800 feet, July 22, 1923 (*Esaki*); one female, Hinoëmata, Iwashiro, altitude 4,000 feet, July 24, 1923 (*Esaki*).

The allotype female may be briefly diagnosed. Length, about 24 millimeters; wing, 23. Characters as in male, differing in the sexual features only. Ovipositor with the cerci long, slender, straight; hypovalvæ relatively high and compressed.

Allotype, female, Hinoëmata, Iwashiro, July 24, 1923 (*Esaki*).

The following description of the remarkable male hypopygium is taken from the holotype male.

Male hypopygium (Plate 3, fig. 36) large and conspicuous, subglobular, tilted at an angle to the remainder of abdomen. Ninth tergite (Plate 3, fig. 37, 9*t*) massive, the caudal margin with a very broad U-shaped notch, the lateral angles formed being very thick and obtusely rounded, on their ventral margin produced into an obtuse black tooth; on the ventral floor of the notch lie two parallel, broad-based teeth, with blunt tips, separated from one another only by a narrow split. Basistyle, *b*, and sternite, 9*s*, united, except for a curved suture beneath. Outer dististyle (Plate 3, fig. 38, *od*) very remarkable, appearing as a long, powerful, terete arm that is strongly curved before midlength, the outer face clothed with long yellow setæ, the apex a little enlarged, obliquely truncated and provided with one or more spines. Inner dististyle (Plate 3, fig. 39, *id*) correspondingly small, heavily blackened. Ninth sternite, 9*s*, deeply notched, the area cephalad of the notch membranous, the proximal margins very tumid and provided with dense long setæ. Eighth sternite, 8*s*, unarmed.

TIPULA NIGROSIGNATA Alexander.

Tipula nigrosignata ALEXANDER, Ann. & Mag. Nat. Hist. IX 14 (1924) 472–473.

Described from a unique male, Lake Chuzenji, Shimotsuke, Honshiu, altitude 4,170 feet, July 22, 1923 (*Esaki*). The female sex is now known and is described herewith as allotype.

Female.—Length, about 21 millimeters; wing, 22.

Characters as in the male, except for the sexual differences of short antennæ. Anepisternum and sternopleurite conspicuously

blackened. Bases of fore and middle coxæ darkened. Ovipositor with cerci long and very slender, the margins smooth.

Allotype, female, Mount Shirouma, Shinano, Honshiu, August 8, 1931 (*Machida and Nakamura*).

TIPULA SEMPITERNA sp. nov. Plate 1, fig. 9; Plate 3, figs. 40, 41.

Mesonotal præscutum with the ground color blackish, with four dark gray stripes; anterior lateral pretergites and dorsopleural region bright yellow; ventral pleurotergite obscure yellow; legs chiefly black, the femora bases broadly yellow, narrowest on the forelegs; wings yellow, variegated with brown, including the wing tip; Rs approximately twice m-cu; male hypopygium with the caudal margin of tergite bearing two triangular spinous lobes; outer dististyle flattened, long and narrow, the apex truncate.

Male.—Length, about 12 millimeters; wing, 16.2.

Frontal prolongation of head grayish brown; nasus distinct; palpi black. Antennæ black throughout, if bent backward not extending to beyond wing root; flagellar segments feebly incised; verticils shorter than the segments. Head brownish gray, the front and anterior vertex clear light gray; vertical tubercle a small but conspicuous conical point.

Anterior pronotum dark brown medially and on the sides, variegated by obscure yellow sublaterally; posterior pronotum and anterior lateral pretergites deep yellow. Mesonotal præscutum with the ground color dull black, with four clear gray stripes, the humeral region and lateral margin yellow; scutum with the lobes chiefly dark gray, variegated with blackish along the suture, the median area of scutum light gray; posterior sclerites of notum gray. Pleura light gray, the ventral pleurotergite abruptly light yellow; dorsopleural region bright yellow. Halteres obscure yellow. Legs with the coxæ gray, their tips pale yellow; trochanters obscure yellow; femora black, their bases yellow, narrowest on the forelegs where less than one-third is included, widest on the middle and hind legs where about the distal third is blackened; tibiæ and tarsi black; tibial spur formula 1–2–2, the mid-tibia with one spur reduced in size, not exceeding one-half the length of the other; claws simple. Wings (Plate 1, fig. 9) with a strong cream-yellow tinge, the prearcular and costal regions brighter yellow; stigma dark brown; wing tip narrowly infuscated; a broad brown seam on anterior cord; narrower dark seams on posterior cord, vein Cu, and vein 1st A; less distinct washes in cell R and at outer end of cell

1st A; veins dark brown, brighter in the costal and prearcular regions. Macrotrichia beyond cord numerous; squama naked. Venation: Rs relatively long, nearly twice m-cu; R_{1+2} entire; m-cu on M_4 shortly beyond fork.

Abdominal tergites dark brown, the lateral borders of the basal segments yellowish; basal sternites yellow; outer segments, including hypopygium, uniformly darkened. Male hypopygium (Plate 3, figs. 40, 41) relatively small, black, only the outer dististyle obscure yellow. Tergite, 9*t*, entirely separate from the sternite. Basistyle, *b*, separated from the sternite by a suture that is broken on the cephalic portion, the caudal end of basistyle narrowed and produced; median region of sternite membranous, the caudal portion slightly produced as a flattened lobule. Ninth tergite, 9*t*, large, the caudal margin produced into two, small, triangular lobes which are separated by a notch that has about the same outline; viewed laterally, each of these lobes bears numerous, small, blackened points on ventral surface; ventrocaudal portion of tergite with a small, blackened, spinous point that is directed ventrad. Outer dististyle, *od*, flattened, relatively long and slender, the apex truncate. Inner dististyle, *id*, bearing a conspicuous, heavily blackened, outer spine, best seen from a ventral aspect; apex of style similarly blackened. Caudal margin of eighth sternite, 8*s*, straight, unarmed.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Kurobegoro, Echiu, in subalpine meadow, altitude 7,800 feet, August 8, 1931 (*Imanishi*).

Tipula sempiterna has no close ally in the Japanese fauna. It bears a certain general resemblance to species such as *T. machidai* Alexander and *T. otiosa* Alexander, but is a very different fly.

TIPULA HIBII sp. nov. Plate 1, fig. 10.

Generally similar to *hylæa;* general coloration gray, the præscutum with a brown median stripe and less-distinct lateral stripes; knobs of halteres yellow; fore femora chiefly blackened, hind femora yellow, passing to black before tips; extreme tips of all femora narrowly but conspicuously reddish; tibiæ yellow, the tips narrowly dark brown; wings pale cream-yellow, with a cross-banded pattern of brown and gray; prearcular region and cell Sc light yellow, cell C dark brown; vein R_{1+2} atrophied.

Female.—Length, about 14 millimeters; wing, 14.

Frontal prolongation of head buffy, sparsely light gray pruinose; nasus slender; palpi dark brown. Antennæ with the scape

and pedicel light yellow; flagellum broken. Head light gray, with indications of a very pale brown median vitta on vertex.

Mesonotum clear light gray, with a broad, conspicuous, median, brown stripe and much paler lateral stripes. Pleura clear gray; dorsopleural membrane very pale yellow. Halteres pale yellow, the extreme base of knob dusky, the majority of knob light yellow. Legs with the coxæ light gray; trochanters obscure yellow; fore femora chiefly blackened, the base narrowly brightened; middle femora obscure yellowish brown to brown, deepening to brownish black before tip; posterior femora obscure yellow, before tips with a broad black ring; tips of all femora very narrowly but conspicuously reddish; tibiæ light yellow, the tips narrowly dark brown; tarsi dark brown; tibial spur formula 1–2–2; claws (female) small, simple. Wings (Plate 1, fig. 10) with the ground color pale cream-yellow, the prearcular region and cell Sc clear light yellow; cell C dark brown except on basal portion; stigma and a relatively narrow crossband on anterior cord dark brown; wing apex in radial field dark brown; paler brownish gray clouds on posterior cord and as a broken fascia before level of origin of Rs, interrupted in cell Cu; outer half of cell 2d A similarly clouded; veins of outer medial field, extreme outer end of cell M, and outer two-thirds of vein 2d A narrowly seamed with dark brown; veins pale yellowish, brown where traversing the darkened areas. Squama naked; long, conspicuous macrotrichia on veins beyond cord. Venation: R_{1+2} atrophied; petiole of cell M_1 long, fully three or more times m.

Abdominal tergites obscure yellow, with a conspicuous median brown stripe that is broadly interrupted at the caudal margins of the segments; basal sternites a little variegated with yellow. Ovipositor with cerci and hypovalvæ straight, both relatively slender, with smooth margins.

Habitat.—Japan (Honshiu).

Holotype, female, Kyusho Mountain, Hôki, June 13, 1930 (*Hibi*).

I take great pleasure in naming this beautiful *Tipula* in honor of the collector, who has secured numerous interesting Tipulidæ in various parts of Hôki. The species is most generally similar to *T. hylæa* Alexander, in the venation and wing pattern, differing in the yellow knobs of the halteres, and, especially, the variegated pattern of the legs, which, in *hylæa*, are uniformly dark brown. *Tipula quadrifasciata* Matsumura (*aluco* Alexander) is also somewhat similar but again differs in the uniformly

darkened legs and knobs of halteres, and in the more cross-banded pattern of the wings, including a broad fascia across cells R and M beyond the arculus.

TIPULA LEGALIS sp. nov. Plate 1, fig. 11; Plate 3, fig. 42.

Antennæ with scape yellow, the remaining segments brownish black; mesonotal præscutum grayish yellow, with three conspicuous blackish stripes, the median one with its center somewhat paler; femoral tips broadly black; wing pattern much as in *cruciata;* outer ends of radial cells uniformly darkened; basal segments of abdomen yellowish, the outer segments black; male hypopygium with the tergite trilobed at apex, the median lobe longest; outer dististyle narrowly and weakly sinuous; eighth sternite with two groups of setæ.

Male.—Length, about 13 millimeters; wing, 13.

Frontal prolongation of head dark brown, a trifle brighter laterally at base; nasus long and slender; palpi dark brown, the terminal segment restrictedly brighter at tip. Antennæ with the scape yellow, a little darkened basally on mesal face; pedicel and flagellum brownish black; flagellar segments with the basal enlargement relatively conspicuous, with elongate verticils. Head dark gray, the anterior vertex behind the antennal bases paler.

Mesonotal præscutum with the ground color grayish yellow, with three conspicuous blackish stripes, the median stripe slightly paler in center; posterior sclerites of mesonotum chiefly blackened, the median region of scutum and mediotergite sparsely pruinose. Pleura chiefly covered by a heavy yellowish pollen, the dorsal portion of the pleurotergite abruptly darkened; dorsopleural membrane buffy; ventral sternopleurite and meron more darkened. Halteres with stem pale yellow, the knobs dark brown. Legs with the coxæ sparsely pruinose, especially the fore and middle coxæ; trochanters yellow; femora yellow, the tips broadly and abruptly black; tibiæ obscure yellow, the tips more narrowly blackened; tarsi passing from brown to black; tibial spur formula 1–2–2; claws with a single basal spine or tooth. Wings (Plate 1, fig. 11) with pattern much as in *cruciata,* the white band beyond cord reaching costa only as a narrow point in cell R_2; outer ends of all radial cells uniformly darkened; markings of basal cells almost as in *cruciata* but not so strongly contrasted. Squama naked. Venation: Rs more than twice as long as m-cu; R_{1+2} entire; basal section of R_{4+5} short but evident, less than r-m; cell 1st M_2 relatively small and short.

Basal four or five abdominal segments yellowish, the remaining segments, including hypopygium, black. Male hypopygium (Plate 3, fig. 42) with the tergite and basistyle entirely cut off by sutures. Ninth tergite, 9*t*, with the caudal margin unequally trilobed, the median lobe longer, the lateral lobes with the outer mesal angle weakly produced into a blackened point. Outer dististyle, *od*, slender, weakly sinuous, the slightly expanded apex very obliquely truncated. Inner dististyle, *id*, with the lobe at base on outer margin small and obtuse. Eighth sternite, 8*s*, moderately sheathing, with long yellow setæ that are arranged in two more or less distinct groups or brushes and become decussate across the midline, with a single marginal row of similar setæ extending across the midline.

Habitat.—China (Szechwan).

Holotype, male, Pehlingting, Mount Omei, altitude 6,000 feet, July, 1931 (*Franck*).

The nearest described ally of this fly seems to be *Tipula cruciata* Edwards (Tibet to Sikkim), which differs notably in the thoracic pattern and less evidently in the structure of the male hypopygium. In *cruciata*, the basal section of vein R_{4+5} is obliterated or nearly so; in the present fly the element is short but distinct.

TIPULA ILLEGITIMA sp. nov. Plate 1, fig. 12.

General coloration of mesothorax gray, the præscutum with scarcely indicated darker gray stripes; basal four or five segments of antennæ light yellow, the succeeding segments darker; wings whitish subhyaline, with a diffuse pale brown pattern, darkest in the outer radial field; pale crossband beyond cord incomplete; R_{1+2} almost entirely atrophied; abdomen obscure yellow, both the tergites and sternites with a conspicuous median brown stripe.

Female.—Length, about 15 millimeters; wing, 12.5.

Frontal prolongation of head relatively long, pale brownish gray; nasus short, tipped with long yellow setæ; palpi dark brown, the extreme tip of the last segment reddish. Antennæ with the scape, pedicel, and basal two flagellar segments light yellow, the succeeding segments passing into brown, the basal enlargements of the segments somewhat darker; dorsal verticils elongate, much exceeding the ventral pair. Head light gray.

Mesonotal præscutum gray, with slightly darker gray stripes that are very little evident; interspaces with sparse brownish setigerous punctures; posterior sclerites of mesonotum gray, the

scutellum with a median brown vitta. Pleura gray, the dorsopleural region more buffy. Halteres yellow, the knobs weakly darkened. Legs with the coxæ pruinose; trochanters yellow; femora and tibiæ obscure yellow, the tips passing into brown; tarsi brown; tibial spur formula 1–2–2. Wings (Plate 1, fig. 12) whitish subhyaline, with a diffuse pale brown pattern, darkest in the stigmal region and in the outer ends of cells R_2 and R_3; cell C yellowish brown, distinctly darker in color than the clear yellow cell Sc; pale crossband beyond cord narrow, extending from costa into basal third of M_3, including approximately one-fourth to one-fifth the length of the radial cells it traverses; pale area in outer ends of cells R and M relatively restricted; veins chiefly yellow. Venation: R_{1+2} atrophied, indicated only by a slight basal spur without macrotrichia; Rs about one-half to two-thirds longer than m-cu; cell 1st M_2 small.

Abdomen obscure yellow, both the tergites and sternites with a conspicuous brown median line. Ovipositor with the cerci long, straight, and slender.

Habitat.—Japan (Honshiu).

Holotype, female, Mount Ohdai, Yamato, altitude 2,600 feet, June 5, 1930 (*Sakaguchi*).

Of the Japanese species of *Tipula* in which R_{1+2} is entirely or chiefly atrophied (*autumna* Alexander, *flavocostalis* Alexander, *futilis* Alexander, *hylæa* Alexander, *manca* Alexander, *phæopasta* Alexander, *pluriguttata* Alexander, *quadrivittata* Matsumura, *subfutilis* Alexander, *taikun* Alexander, *trupheoneura* Alexander), the present form is most similar to *flavocostalis*, differing in the body coloration and in the wing pattern, as the more cream-yellow ground color and the very diffuse pale brown pattern. In *flavocostalis*, vein R_{1+2} is represented by a short spur that is provided with a few macrotrichia.

TIPULA TRUPHEONEURA Alexander. Plate 4, fig. 43.

Tipula trupheoneura ALEXANDER, Trans. Am. Ent. Soc. 46 (1920) 17–18.

The unique type, a female, was from Saitama, Musashi, Honshiu, collected May 31, 1919, by Takahashi. An additional male and a female were taken on Mount Daisen, Hôki, altitude 3,900 to 5,200 feet, June 7, 1930, by Hibi. The male is herewith characterized as allotype.

Male.—Characters as in the female, including the infuscated, weakly pruinose antennal scape. Male hypopygium with the tergite separated from the sternite by a suture. Ninth tergite

(Plate 4, fig. 43, 9*t*, *a*) appearing as a subquadrate plate, its caudal margin subtransverse, with a deep and narrow, parallel-sided, median notch; caudal margin on either side of median notch with microscopic denticles. Basistyle complete, its caudal margin not produced, as is the case in the similar species, *pollex* sp. nov. Outer dististyle, *od*, *a*, relatively small, with conspicuous setæ. Inner dististyle broad, the outer ventral angle produced into a fingerlike lobe. Ninth sternite on mesial portion, immediately adjoining the basistyle, produced into a blackened spikelike point, the oval area from which the spine arises surrounded by membrane. This structure must function almost as a gonapophysis, yet is evidently a development of the sternite (fig. 43, 9*s*, *a*). Eighth sternite unarmed and scarcely sheathing; its median portion is less strongly sclerotized, especially near the caudal margin, forming a pale triangular area destitute of, or with more sparse, setæ; from beneath the caudal margin of the sternite protrudes pale membrane that is usually hidden beneath the sclerite.

Allotype, male, Mount Daisen, Hôki altitude 3,900 feet, June 7, 1930 (*Hibi*).

An additional male, taken at Gokanosho, Higo, Kyūshū, altitude 700 feet, April 29, 1924 (*H. Hori*), has a slightly different hypopygium but still seems certainly to fall within the limits of the present species. Male hypopygium more heavily blackened. Ninth tergite, 9*t*, *b*, with the caudal margin less transverse, each lobe subtriangular in outline, its mesal slope with conspicuous denticles. The blackened spine on the ninth sternite, 9*s*, *b*, is somewhat stouter.

TIPULA POLLEX sp. nov. Plate 1, fig. 13; Plate 4, fig. 44.

Thorax clear ashy gray, the præscutal stripes scarcely evident; antennæ with scape and pedicel light yellow, flagellum black; fore femora extensively blackened, the remaining femora blackened only at tips; wings whitish, including a broad, almost complete crossband beyond cord; wing tip strongly infumed; R_{1+2} entire; basal abdominal segments yellow, the outer segments blackened; ninth tergite of hypopygium produced into a compressed median blade; basistyle produced into a compressed fingerlike lobe; eighth sternite unarmed.

Male.—Length, about 15 to 16 millimeters; wing, 15 to 16.

Frontal prolongation of head obscure yellow, slightly pruinose at base; nasus very short and blunt; palpi dark brown. Antennæ (male) of moderate length, if bent backward ending

shortly before base of abdomen; scape and pedicel light yellow; flagellum black. Head light ashy gray.

Mesonotum light ashy gray, the very slightly darker præscutal stripes almost obsolete. Pleura ashy gray, the dorsopleural region pale yellow. Halteres pale yellow, the knobs weakly darkened. Legs with the coxæ whitish pruinose; trochanters pale yellow; femora yellow basally, the tips conspicuously blackened, broadest on the forelegs, where about the outer three-fourths is included, very narrow on the middle and hind femora where only the tips are darkened; tibiæ brown; tarsi black; tibial spur formula 1–2–2; claws small, simple. Wings (Plate 1, fig. 13) with the ground color whitish, most apparent as a broad, nearly complete crossband beyond the cord, including approximately the basal half of cells R_2, R_3, and M_3, the basal two-fifths of R_5, and almost all of cell 1st M_2; other large areas of the ground color lie at two-thirds the length of cell M and before midlength of 1st A; wing tip broadly and conspicuously darkened, more intense in the radial field; stigma and a narrow seam on anterior cord dark brown; prearcular region and cells C and Sc light yellow; remainder of cells before cord a very pale brown; obliterative areas including the outer end of Rs and the basal sections of veins M_{1+2} and M_3; veins dark brown, flavous in the yellow areas. Macrotrichia on all longitudinal veins beyond cord; squama naked. Venation: R_{1+2} entire, with all but the base pale and without trichia; Rs more than twice the length of m-cu; cell 1st M_2 elongate, narrowed outwardly; petiole of cell M_1 about one-third longer than m.

Basal abdominal segments yellow, the tergites with a conspicuous median brown stripe that is almost continuous; fourth and succeeding tergites blackish, all but the last with broad, lateral, and less conspicuous pale caudal margins; sternites five to seven, inclusive, similar in color; hypopygium blackened. Male hypopygium (Plate 4, fig. 44) with the tergite and basistyle entirely separate; an additional small triangular sclerite cut from caudodorsal portion of ninth sternite, above the basistyle. Ninth tergite, *9t*, heavily sclerotized, the caudal margin with a highly compressed median blade. Basistyle, *b*, produced caudad into a flattened fingerlike lobe; ventrocaudal angle of basistyle produced slightly caudad beyond the level of the sternite. Inner dististyle, *id*, with the outer margin near base armed with several small spinous points, the more basal ones larger. Eighth sternite unarmed, its caudal margin evenly convex, not sheathing.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Daisen, Hôki, altitude 4,550 feet, June 7, 1930 (*Hibi*). Paratopotype, male, altitude 5,200 feet, June 7, 1930 (*Hibi*).

Tipula pollex is very similar to *T. trupheoneura* Alexander, differing in the persistence of vein R_{1+2}, the almost obsolete præscutal stripes, and the very different male hypopygium.

TIPULA SETICELLULA LONGILIGULA subsp. nov. Plate 4, fig. 45.

Almost exactly as in the typical form but with the lobe of the eighth sternite (Plate 4, fig. 45, 8*s*) of quite different form, being elongate, narrowed outwardly, the lobe fringed with long, conspicuous, darkened setæ. On either side of lobe, a loose pencil of elongate setæ.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Ohdai. Yamato, altitude 3,250 feet, June 5, 1930 (*Sakaguchi*). Allotopotype, female. Paratopotypes, 1 male, 1 female.

LIMONIINÆ

LIMONIINI

LIMONIA (DICRANOMYIA) SUSPENSA sp nov. Plate 1, fig. 14; Plate 4, fig. 46.

General coloration reddish brown; antennæ with short-oval flagellar segments; wings with a faint brown tinge, the stigma pale; distal section of vein M_3 lying suspended in membrane, both the basal section of M_3 and m atrophied; male hypopygium with two or three rostral spines.

Male.—Length, about 5 millimeters; wing, 5.5.

Female.—Length, about 6 millimeters; wing, 5.5.

Rostrum yellow; palpi short, brown. Antennæ pale brown; flagellar segments short-oval, becoming slightly longer at outer end of organ; verticils short, inconspicuous. Head pale brown.

Mesonotum and pleura pale reddish brown to darker liver brown, without evident markings; pleura very sparsely and vaguely pruinose. Halteres pale, the knobs weakly darkened. Legs with the coxæ and trochanters reddish brown; remainder of legs obscure yellow. Wings (Plate 1, fig. 14) with a faint brown tinge, the stigma scarcely darker; veins brown. Macrotrichia lacking on free tip of Sc_2, R_2, and on anterior cord except for distal half of basal section of R_{4+5}. Venation: Sc_1 ending approximately opposite origin of Rs, Sc_2 a short distance from its tip; distal section of M_3 suspended in the membrane of wing, with both m and basal section of M_3 atrophied; m-cu shortly before fork of M; cell 2d A wide.

Abdomen, including the hypopygium, reddish brown. Male hypopygium (Plate 4, fig. 46) with the caudal margin of tergite, 9*t*, notched medially, the lateral lobes broadly rounded. Dorsal dististyle strongly curved. Ventral dististyle, *vd*, moderately large, exceeding the basistyle in area, the rostral prolongation long and slender, with two, or sometimes, three, rostral spines at its base, these arising from short, inconspicuous tubercles. Mesal-apical lobe of gonapophysis, *g*, slender, strongly curved, entirely pale.

Habitat.—Japan (Honshiu).

Holotype, male, Seto, Kii, strictly marine, June 10, 1930 (*Tokunaga*). Allotopotype, female. Paratopotype, 1 male.

Limonia (*Dicranomyia*) *suspensa* is the fourth marine crane fly belonging to this genus that has been discovered by Tokunaga at Seto.[5] The curious venation of the medial field of the wing is constant in all specimens before me and certainly appears to represent a normal condition which will serve to separate this fly from all other regional species. In this regard, the insect lies about midway between the conditions found in the subgenera *Dicranomyia* and *Alexandriaria*, the former having either m or the basal section of M_3, or both, preserved, while the latter group has m and both sections of M_3 atrophied. I am referring the species to the subgenus *Dicranomyia*.

LIMONIA (RHIPIDIA) GARRULOIDES sp. nov. Plate 1, fig. 15; Plate 4, fig. 47.

Mesonotum dark grayish brown, the præscutum with a darker brown median stripe; antennæ (male) only 11-segmented, the flagellum with eight branched segments; halteres whitish; tarsi chiefly snowy white; wings milky white, the apex and a broad seam along cord infuscated; Rs relatively short, only about one-half longer than R_{2+3}; caudal margins of intermediate segments narrowly pale.

Male.—Length, about 4 millimeters; wing, 4.4.

Rostrum and palpi dark brown. Antennæ only 11-segmented, dark brown, the apical pedicles white; basal eight flagellar segments bipectinate, only the terminal segment being simple; branches shorter than in *garrula*. Head dark grayish brown.

Pronotum dark brown, more yellowish pollinose dorsally. Mesonotum dark grayish brown, the præscutum with a median darker brown stripe. Pleura chiefly dark grayish brown, not clearly visible in the unique type. Halteres whitish. Legs with the coxæ and trochanters dark; femora brownish black, brightened

[5] Philip. Journ. Sci. 49 (1932) 112–115.

at bases, the fore femora yellow with only the tips narrowly blackened; fore tibiæ brownish yellow, the tips narrowly and vaguely darkened, remaining tibiæ brownish black; basitarsi snowy white, with only the extreme bases blackened, this slightly broader on the forelegs, where about one-sixth is included; posterior basitarsi with only a microscopic portion darkened; remainder of tarsi white, with only the terminal segment black. Wings (Plate 1, fig. 15) milky white, the apex and a broad area at the cord brown, a little less intense than the dark brown stigma, these two areas leaving a complete white crossband between them; region of arculus weakly darkened; veins pale in the ground, darker in the clouded areas. Venation: Sc_1 ending just beyond origin of Rs, Sc_2 not evident in the unique type; Rs relatively short, only about one-half longer than R_{2+3}; cell 2d A relatively narrow.

Abdomen brownish black, the caudal margins of the intermediate tergites narrowly paler; outer segments uniformly darkened; hypopygium, including the ventral dististyle, darkened. Male hypopygium (Plate 4, fig. 47) with the tergite, 9*t*, transverse, the caudal margin notched to form two evenly rounded lobes. Rostral prolongation of ventral dististyle, *vd*, with the two spines arising from a common tubercle, the spines longer and slenderer than in *garrula*. Mesal-apical lobe of gonapophysis, *g*, relatively stout.

Habitat.—China (Szechwan).

Holotype, male, Mount Omei, altitude 3,500 feet, July 17, 1931 (*Franck*).

Limonia (*Rhipidia*) *garruloides* is most nearly allied to *L.* (*R.*) *garrula* Alexander, likewise from western China, differing most evidently in the reduced number of antennal segments, the more extensively whitened tarsi, and the distinct wing pattern and venation.

PEDICIINI

PEDICIA (TRICYPHONA) CUBITALIS sp. nov. Plate 1, fig. 16.

General coloration of thorax gray; antennæ 13-segmented, the intermediate flagellar segments crowded, transverse; legs relatively short and stout; femora yellow, the tips narrowly blackened; wings light yellow, veins R, Cu, and the cord narrowly seamed with dark brown, forming a nearly complete discal triangle; abdomen orange, the tergites with a median black vitta, the outer segments darker.

Female.—Length, about 24 millimeters; wing, 18.5.

Rostrum gray; palpi brownish black; terminal segment short, not exceeding the penultimate. Antennæ 13-segmented; scape dark brown, the remainder of organ a trifle paler; intermediate flagellar segments short and crowded, transverse, the longest verticils unilaterally arranged, exceeding the segments; outer flagellar segments smaller and more elongate. Head gray; vertical tubercle very small.

Mesonotal præscutum light gray, with three darker gray stripes, the interspaces with yellow setæ; posterior sclerites of mesonotum darker, the caudal margin of the mediotergite slightly infumed. Pleura gray, more or less covered by yellowish pollen. Halteres pale yellow, the knobs weakly darkened. Legs relatively short and stout; coxæ and trochanters yellow; femora yellow, the tips narrowly brownish black; tibiæ brownish yellow, the tips narrowly darkened; tarsi black. Wings (Plate 1, fig. 16) with the ground color light yellow, cells C and Sc a little darker, more brownish yellow; restricted dark brown seams adjoining vein R, in cell R, extending from arculus to origin of Rs; along vein Cu; and a slightly wider seam along the cord, the three areas forming the three sides of a typical *Pedicia*-triangle, broken only between the origin of Rs and the cord; posterior prearcular region darkened; outer end of cell 1st M_2 weakly darkened; stigma yellowish brown; veins brownish yellow, darker in the infuscated areas, with extensive obliterative areas along cord. Venation: Sc_2 faint, a short distance before origin of Rs; r-m connecting with Rs before its fork; R_2 about opposite the fork of R_{4+5}; cell 1st M_2 closed; cord moderately oblique.

Abdomen with the basal tergite gray; tergites two to five orange, with a continuous median black vitta; outer segments more pruinose laterally, blackened medially; sternites orange, the outer segments darkened medially. Ovipositor with the dorsal shield and cerci blackened.

Habitat.—Japan (Honshiu).

Holotype, female, Mount Kurobegoro, Echiu, in subalpine meadow, altitude 7,800 feet, August 10, 1931 (*Imanishi*).

Pedicia (*Tricyphona*) *cubitalis* is most nearly allied to the Japanese *gaudens* (Alexander) and *grandior* (Alexander), all three species being closely related and suggesting in a striking manner the smaller species of the typical subgenus *Pedicia* Latreille. The present fly differs from the two above-mentioned species in the narrow but conspicuous dark cubital seam and the entirely flavescent central portion of the wing disk, this being

much paler than the margins in both listed species. Only the male sex of *gaudens* and *grandior* has been discovered; *gaudens* has the antennæ 13-segmented, the flagellum brownish yellow, much paler than the black scape and pedicel, and the basal abdominal tergites without a continuous black median stripe; *grandior* has only 11-segmented antennæ and has the dark wing pattern much reduced.

DICRANOTA (RHAPHIDOLABIS) SPINA sp. nov. Plate 1, fig. 17; Plate 4, fig. 48.

General coloration gray, the præscutum with three more blackish stripes; antennæ 13-segmented, black throughout; wings milky, the stigma scarcely indicated; cell R_3 nearly sessile, R_{2+3+4} being reduced to a punctiform element; male hypopygium with the median region of tergite broadly convex, each lateral arm produced into a straight acute spine; interbase a powerful flattened rod, the apex narrowed to an acute spine.

Male.—Length, about 5.5 millimeters; wing, 5.8.

Rostrum and palpi black. Antennæ 13-segmented, short, black throughout; flagellar segments oval, the verticils shorter than the segments; terminal segment smaller than the penultimate. Head gray.

Mesonotum gray, the præscutum with three ill-defined, more blackish stripes. Pleura gray. Halteres pale, the knobs slightly infuscated. Legs with the coxæ obscure yellow; trochanters yellow; femora yellow, passing into brown at about the basal third; remainder of legs brown. Wings (Plate 1, fig. 17) with a milky ground color, somewhat more grayish on outer half; stigma scarcely indicated; veins pale brown. Macrotrichia of veins short but abundant, on all veins beyond cord, M and 1st A except basal fifth, Cu except basal third, 2d A on about distal half. Venation: R_{1+2} about one-half R_2; cell R_3 nearly sessile, R_{2+3+4} indicated only by a punctiform element; m-cu more than one-half its length beyond fork of M.

Abdomen dark grayish brown; hypopygium more yellowish. Male hypopygium (Plate 4, fig. 48) with the median region of tergite, 9*t*, broadly convex, with numerous erect setæ; lateral arm of tergite produced into a slender, straight, acute spine. Basistyle, *b*, with the outer apical lobe a little produced and set with rather sparse spines; interbase, *i*, a powerful, flattened rod, at about two-thirds the length gradually curved to form a right-angled, gently curved, acute spine, the surface glabrous. Outer dististyle, *od*, stout-clavate, the apex with more-abundant spines.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Kurobegoro, Echiu, in subalpine meadow, altitude 7,800 feet, August 13, 1931 (*Imanishi*).

Dicranota (*Rhaphidolabis*) *spina* is readily distinguished from the other regional species in eastern Asia by the milky white wings, with cell R_3 nearly sessile, and by the acute, straight, lateral spine of the ninth tergite of the male hypopygium.

DICRANOTA (AMALOPINA) MEGAPLAGIATA sp. nov. Plate 1, fig. 18.

Allied to *gibbera;* general coloration of thorax pale yellow, the postnotum somewhat darker; wings whitish, sparsely variegated with brown, including a major area extending from costa across anterior cord; cell 1st M_2 open by atrophy of m.

Female.—Length, about 5 millimeters; wing, 5.

Rostrum and palpi brownish black. Antennæ with the scape black; flagellum light yellow. Head grayish brown.

Mesonotum pale yellow, the postnotum somewhat darker. Pleura pale yellow. Halteres pale yellow throughout. Legs all detached; what appear to represent the forelegs have the femora and extreme bases of tibiæ brownish black; remainder of legs whitish, the outer tarsal segments darkened; one other pair of legs is present, whitish, the tips of the femora, narrower tips of tibiæ, and outer segments of tarsus darkened. Wings (Plate 1, fig. 18) whitish, with a restricted brown pattern, including a single large area extending from costa across wing to fork of M; additional small brown dots, distributed as follows: Sc_2, origin of Rs, R_2, posterior cord, marginal dots at ends of longitudinal veins, forks of M_{1+2} and M_{3+4}, and two or three small spots in cell Cu adjoining vein 1st A; veins pale, darker in the infuscated areas.

Abdominal tergites bicolorous, the apices conspicuously dark brown, the central parts of the basal rings obscure yellow, the lateral portions more darkened; sternites more extensively yellow, the caudal margins of the segments narrowly darkened.

Habitat.—China (Szechwan).

Holotype, female, Mount Omei, altitude 7,000 feet, July 17, 1931 (*Franck*).

The present fly is undoubtedly allied to *D.* (*A.*) *elegantula* (Brunetti) and *D.* (*A.*) *gibbera* (Alexander), differing from all known species by the large darkened area on the anterior cord of the wings. In *gibbera,* the fore and middle femora are darkened, while the posterior femora are chiefly pale. It seems certain that this is the condition obtaining in the present fly.

ULA SUCCINCTA sp. nov. Plate 1, fig. 19; Plate 4, fig. 49.

General coloration yellowish brown, the head dark; femora yellow, the tips vaguely darkened; wings brownish yellow, almost immaculate; stigma uniformly pale yellowish brown; abdominal tergites uniformly dark brown; basal sternites yellow.

Male.—Length, about 5.5 millimeters; wing, 5.5.

Rostrum obscure yellow, darker medially above; palpi brown, the elongate terminal segment paling to obscure yellow. Antennæ with the scape and pedicel brownish yellow; flagellum dark brown; flagellar segments (male) subcylindrical, with short, inconspicuous verticils. Head dark brown, possibly pruinose in dry specimens.

Mesonotum and pleura yellowish brown, the humeral region of præscutum obscure yellow. Halteres pale. Legs with the coxæ yellow, the fore coxæ slightly darkened at bases; trochanters yellow; femora and tibiæ obscure yellow, the tips of the former vaguely darkened; tarsi yellow, passing to brown on outer segments. Wings (Plate 1, fig. 19) brownish yellow, almost immaculate, the stigma uniformly pale yellowish brown, without distinctly darkened ends; an almost imperceptible clouding along anterior cord; veins brownish yellow.

Abdominal tergites uniformly dark brown; sternites two to five yellow. Male hypopygium (Plate 4, fig. 49) with the ninth tergite, *9t*, gradually narrowed outwardly, the caudal margin with a deep U-shaped median notch, the lateral lobes obtusely rounded at tips. Dististyle, *d*, relatively long and slender, the outer end with about fifteen black spines.

Habitat.—Japan (Honshiu).

Holotype, alcoholic male, Mount Mitake, Musashi, May 10, 1931 (*Oda*).

Ula succincta is closest to *U. cincta* Alexander (Hokkaido), which is still known to me only in the female sex. The present fly differs in the more nearly immaculate wings, with the central portion of the stigmal area concolorous with the ends, and in the uniformly darkened abdominal tergites.

HEXATOMINI

LIMNOPHILA (PRIONOLABIS) ODAI sp. nov. Plate 1, fig. 20; Plate 4, fig. 50.

Male.—Length, about 8 millimeters; wing, 7.

Female.—Length, about 10 millimeters; wing, 8.5.

Closely allied and generally similar to *submunda*, differing especially in slight details of the male hypopygium. Wings (Plate

1, fig. 20) unusually broad. Legs with the femora obscure yellow, the tips narrowly dark brown, the latter approximately equal in degree on all legs, including the fore pair, embracing (male) about the outer fourth to fifth. Male hypopygium (Plate 4, fig. 50) with the outer dististyle, *od*, bearing a single major subapical spine. Inner dististyle, *id*, with two, long, erect, subterminal spines, the apex beyond this point slender. Gonapophyses, *g*, pale throughout.

Limnophila (*Prionolabis*) *odai* is named in honor of the collector, Prof. Bunkichi Oda, who has collected numerous Tipulidæ in the vicinity of Tokyo. The only other species that is close to this fly is *L.* (*P.*) *submunda* Alexander, of Honshiu and Kyūshū.[6] The latter fly is the only described Japanese member of the subgenus with dusky gonapophyses, and presents a general appearance very different from that found in the present fly.

ERIOPTERINI

ORMOSIA MACHIDANA sp. nov. Plate 1, fig. 21; Plate 4, fig. 51.

General coloration of mesonotal præscutum dark reddish brown, with a narrow, darker brown, median vitta; posterior sclerites of mesonotum and the pleura brownish black; halteres yellow; wings with anal veins convergent; male hypopygium with the inner dististyle a slender, gently curved rod; two pairs of gonapophyses, the inner pair slightly expanded and weakly roughened at tips.

Male.—Length, about 4.5 millimeters; wing, 5.3; antenna, about 1.25.

Rostrum and palpi black. Antennæ brownish black, relatively long, as shown by the measurements; flagellar segments elongate, with verticils that exceed the segments. Head blackish.

Mesonotal præscutum dark reddish brown, with a narrow, darker brown, median vitta; humeral region obscure yellow, inclosing the blackish pseudosutural foveæ; posterior sclerites of mesonotum and the pleura brownish black, sparsely pruinose. Halteres yellow. Legs with the coxæ brown; trochanters obscure yellow; legs yellowish brown, the outer tarsal segments darker. Wings (Plate 1, fig. 21) with a brownish tinge, the stigma darker; basal portion of wing more yellowish; veins brown. Venation: Sc_2 nearly opposite midlength of Rs; cell 1st M_2 open

[6] Entomol. Mag. Kyoto 3 (1919) 125–126.

by atrophy of basal section of M_3; vein 2d A strongly sinuous, cell 1st A being widest at midlength.

Abdomen, including hypopygium, dark brown. Male hypopygium (Plate 4, fig. 51) with the tergite, 9*t*, appearing as a conspicuous spatula. Outer dististyle, *od*, broad, dilated at near midlength, the apex blackened and acutely pointed. Inner dististyle a slender, gently curved rod. Gonapophyses, *g*, in two pairs, the outer pair appearing as slender blackened spines, the inner pair stouter, their apices weakly expanded and microscopically roughened.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Shirouma, Shinano, August 8, 1931 (*Machida and Nakamura*).

I take pleasure in naming this distinct *Ormosia* in honor of my old friend Dr. Jiro Machida, to whom I am deeply indebted for many kind favors in the past decade. The species is distinct from all others in eastern Asia in the structure of the male hypopygium. It comes closest to the group containing *O. takahashii* Alexander, *O. takeuchii* Alexander, and *O. tokunagai* Alexander, yet is amply distinct in the conformation of the dististyles and gonapophyses.

MOLOPHILUS PICTIFEMORATUS sp. nov. Plate 1, fig. 22.

Belongs to the *gracilis* group and subgroup; rostrum, palpi, and antennæ black; head and thorax dark brown; halteres yellow; femora brown, the tips broadly blackened, preceded by a much narrower, clear yellow ring; wings with a strong dusky tinge; vein 2d A ending before level of m-cu.

Female.—Length, about 3 millimeters; wing, 3.5.

Rostrum and palpi black. Antennæ black throughout; flagellar segments oval, with long, conspicuous verticils. Head dark brown.

Mesonotum almost uniformly dark brown, the anterior lateral pretergites restrictedly obscure yellow, the posterior sclerites of notum even darker. Pleura brownish black. Halteres yellow. Legs with the femora restrictedly pale basally, passing into brown, the tips broadly and conspicuously blackened, preceded by a much narrower clear yellow ring; tibiæ dark brown, the bases narrowly yellow, the tips slightly more broadly brownish black; tarsi dark brown. Wings (Plate 1, fig. 22) with a strong dusky tinge, the prearcular region narrowly and vaguely obscure

yellow; veins pale brown, the macrotrichia darker. Venation: R_2 in approximate alignment with r-m; vein 2d A relatively short, ending just before the level of m-cu.

Abdomen brownish black, the basal sternites paler. Ovipositor with the cerci very long and only slightly upcurved.

Habitat.—China (Szechwan).

Holotype, female, Mount Omei, altitude 3,500 feet, August 16, 1931 (*Franck*).

Molophilus pictifemoratus differs from all regional species of the genus in the pattern of the legs, especially of the femora.

MOLOPHILUS NAKAMURAI sp. nov. Plate 1, fig. 23; Plate 4, fig. 52.

Belongs to the *gracilis* group and subgroup; general coloration yellow; femora with more than the outer half black, the bases yellow; tibiæ light yellow, the tips narrowly brownish black; wings relatively narrow, yellowish gray, the costal border pale yellow; male hypopygium with the dorsal lobe of basistyle with setæ to tip; two simple dististyles, one obtuse at apex, the other narrowed to an acute point.

Male.—Length, about 3.5 to 4 millimeters; wing, 4.3 to 5.

Female.—Length, about 4.5 millimeters; wing, 5.

Rostrum and palpi dark brown. Antennæ short in both sexes, if bent backward extending to shortly beyond the wing root; basal four or five segments yellow, the remainder of flagellum brown. Head gray, the genæ and occiput in cases more yellowish.

Mesonotum light orange, the lateral pretergites pale yellow; posterior sclerites of mesonotum more testaceous. Pleura testaceous-yellow. Halteres yellow. Legs with the coxæ and trochanters yellow; femora with about the basal third obscure yellow, the remainder brownish black; tibiæ abruptly pale yellow, the tips narrowly brownish black; basal segments of tarsus obscure yellow, the narrow tips of the segments darkened; outer tarsal segments dark brown. Wings (Plate 1, fig. 23) narrow, pale yellowish gray, the prearcular and costal portions clear yellow; veins pale and difficult to distinguish; trichia pale brown, those of the costal fringe light yellow. Venation: Vein 2d A long, extending nearly parallel to 1st A for most of its length.

Abdominal tergites brownish yellow, the caudal margins of segments narrowly paler; sternites and hypopygium clear yellow. Male hypopygium (Plate 4, fig. 52) with the dorsal lobe of

basistyle, *b*, moderately stout, with setæ to its tip. Outer dististyle, *od*, at apex expanded into a weak club that is microscopically spiculose. Inner dististyle, *id*, a little shorter, gradually narrowed to a needlelike point, the extreme tip pale.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Shirouma, Shinano, August 8, 1931 (*Machida and Nakamura*). Allotopotype, female. Paratopotypes, 4 males.

Molophilus nakamurai is named in honor of Mr. Toyoji Nakamura, collector of a number of rare species in the Japanese Alps. The peculiar pattern of the legs is quite distinctive of the species. The structure of the male hypopygium is much as in *M. pegasus* Alexander, but in all other respects the two flies are clearly different.

MOLOPHILUS TAKAOENSIS sp. nov. Plate 1, fig. 24; Plate 4, fig. 53.

Belongs to the *gracilis* group and subgroup; general coloration black; halteres yellow; male hypopygium with the dorsal lobe of basistyle short and obtuse; inner dististyle sinuous, bearing an acute lateral spine at about midlength.

Male.—Length, about 2.8 millimeters; wing, 3.3.

Described from a dried specimen formerly preserved in spirit.

Rostrum black; palpi brownish yellow, the terminal segment more infuscated. Antennæ (male) short, if bent backward extending to shortly beyond the wing root; scape brown, the succeeding four or five segments light yellow, the outer segments infuscated. Head black.

Mesonotum and pleura shiny black; if any bloom is normally present, it is destroyed by immersion in spirit. Halteres yellow. Legs with the fore coxæ light brownish yellow, the remaining coxæ light yellow; trochanters yellow; remainder of legs chiefly yellow, the tips of femora and tibiæ narrowly and weakly darkened; terminal tarsal segments infuscated; one detached leg, evidently one of the fore pair, has about the distal half of femora dark brown, the tibia with a pale brown subbasal ring; most of vestiture of legs is lost through immersion in spirit, but enough persists to indicate that the setæ of the yellow portions of the legs are pale in color. Wings (Plate 1, fig. 24) with a weak brown tinge; veins darker brown. Venation: R_{4+5} in general longitudinal alignment with Rs; petiole of cell M_3 about twice m-cu; vein 2d A relatively short, ending before m-cu.

Abdomen, including hypopygium, brownish black. Male hypopygium (Plate 4, fig. 53) with the dorsal lobe, *db*, of basistyle short and obtuse; mesal lobe, *mb*, darkened, densely set with numerous recurved setulæ; ventral lobe longest, with a marginal fringe of coarse setæ. Two dististyles, the outer, *od*, a slender simple rod, with appressed denticles on outer two-thirds; inner style, *id*, longer, strongly sinuous, at near midlength bearing a slender acute spine, beyond which point the surface of style is roughened into appressed teeth, the long acute apex glabrous.

Habitat.—Japan (Honshiu).

Holotype, male, Mount Takao, Musashi, June 1, 1930 (*Oda*).

Molophilus takaoensis is most generally similar to *M. trifilatus* Alexander, differing most evidently in the very different male hypopygium.

ILLUSTRATIONS

[Legend: *a*, ædeagus; *b*, basistyle; *d*, dististyle; *db*, dorsal lobe of basistyle; *g*, gonapophysis; *i*, interbase; *id*, inner dististyle; *mb*, mesal lobe of basistyle; *od*, outer dististyle; *s*, sternite; *t*, tergite; *vb*, ventral lobe of basistyle; *vd*, ventral dististyle.]

PLATE 1

FIG. 1. *Dolichopeza* (*Oropeza*) *inomatai* sp. nov.; venation.
2. *Macgregoromyia brevicula* sp. nov.; venation.
3. *Tipula* (*Schummelia*) *bidenticulata* sp. nov.; venation.
4. *Tipula* (*Schummelia*) *jocosipennis* sp. nov.; venation.
5. *Tipula* (*Schummelia*) *imanishii* sp. nov.; venation.
6. *Tipula* (*Acutipula*) *subturbida* sp. nov.; venation.
7. *Tipula sakaguchiana* sp. nov.; venation.
8. *Tipula quadrispicata* sp. nov.; venation.
9. *Tipula sempiterna* sp. nov.; venation.
10. *Tipula hibii* sp. nov.; venation.
11. *Tipula legalis* sp. nov.; venation.
12. *Tipula illegitima* sp. nov.; venation.
13. *Tipula pollex* sp. nov.; venation.
14. *Limonia* (*Dicranomyia*) *suspensa* sp. nov.; venation.
15. *Limonia* (*Rhipidia*) *garruloides* sp. nov.; venation.
16. *Pedicia* (*Tricyphona*) *cubitalis* sp. nov.; venation.
17. *Dicranota* (*Rhaphidolabis*) *spina* sp. nov.; venation.
18. *Dicranota* (*Amalopina*) *megaplagiata* sp. nov.; venation.
19. *Ula succincta* sp. nov.; venation.
20. *Limnophila* (*Prionolabis*) *odai* sp. nov.; venation.
21. *Ormosia machidana* sp. nov.; venation.
22. *Molophilus pictifemoratus* sp. nov.; venation.
23. *Molophilus nakamurai* sp. nov.; venation.
24. *Molophilus takaoensis* sp. nov.; venation.

PLATE 2

FIG. 25. *Dolichopeza* (*Oropeza*) *inomatai* sp. nov.; male hypopygium.
26. *Macgregoromyia brevicula* sp. nov.; male hypopygium.
27. *Tipula* (*Schummelia*) *bidenticulata* sp. nov.; male hypopygium, details.
28. *Tipula* (*Schummelia*) *jocosipennis* sp. nov.; male hypopygium, lateral aspect; ninth tergite.
29. *Tipula* (*Schummelia*) *imanishii* sp. nov.; male hypopygium, details.
30. *Tipula* (*Acutipula*) *intacta* sp. nov.; male hypopygium, details.
31. *Tipula* (*Acutipula*) *subturbida* sp. nov.; male hypopygium, inner dististyle.
32. *Tipula sakaguchiana* sp. nov.; male hypopygium, details.

PLATE 3

FIG. 33. *Tipula* (*Vestiplex*) *serridens* Alexander; male hypopygium, details.
34. *Tipula quadrispicata* sp. nov.; male hypopygium, details.
35. *Tipula tetracantha* Alexander; male hypopygium, details.
36. *Tipula curvicauda* Alexander; male hypopygium, lateral aspect.
37. *Tipula curvicauda* Alexander; male hypopygium, ninth tergite.
38. *Tipula curvicauda* Alexander; male hypopygium, outer dististyle.
39. *Tipula curvicauda* Alexander; male hypopygium, inner dististyle.
40. *Tipula sempiterna* sp. nov.; male hypopygium, details.
41. *Tipula sempiterna* sp. nov.; male hypopygium, details.
42. *Tipula legalis* sp. nov.; male hypopygium, details.

PLATE 4

FIG. 43. *Tipula trupheoneura* Alexander; male hypopygium, details.
44. *Tipula pollex* sp. nov.; male hypopygium, details.
45. *Tipula seticellula longiligula* subsp. nov.; male hypopygium, eighth sternite.
46. *Limonia* (*Dicranomyia*) *suspensa* sp. nov.; male hypopygium.
47. *Limonia* (*Rhipidia*) *garruloides* sp. nov.; male hypopygium.
48. *Dicranota* (*Rhaphidolabis*) *spina* sp. nov.; male hypopygium.
49. *Ula succincta* sp. nov.; male hypopygium.
50. *Limnophila* (*Prionolabis*) *odai* sp. nov.; male hypopygium.
51. *Ormosia machidana* sp. nov.; male hypopygium.
52. *Molophilus nakamurai* sp. nov.; male hypopygium.
53. *Molophilus takaoensis* sp. nov.; male hypopygium.

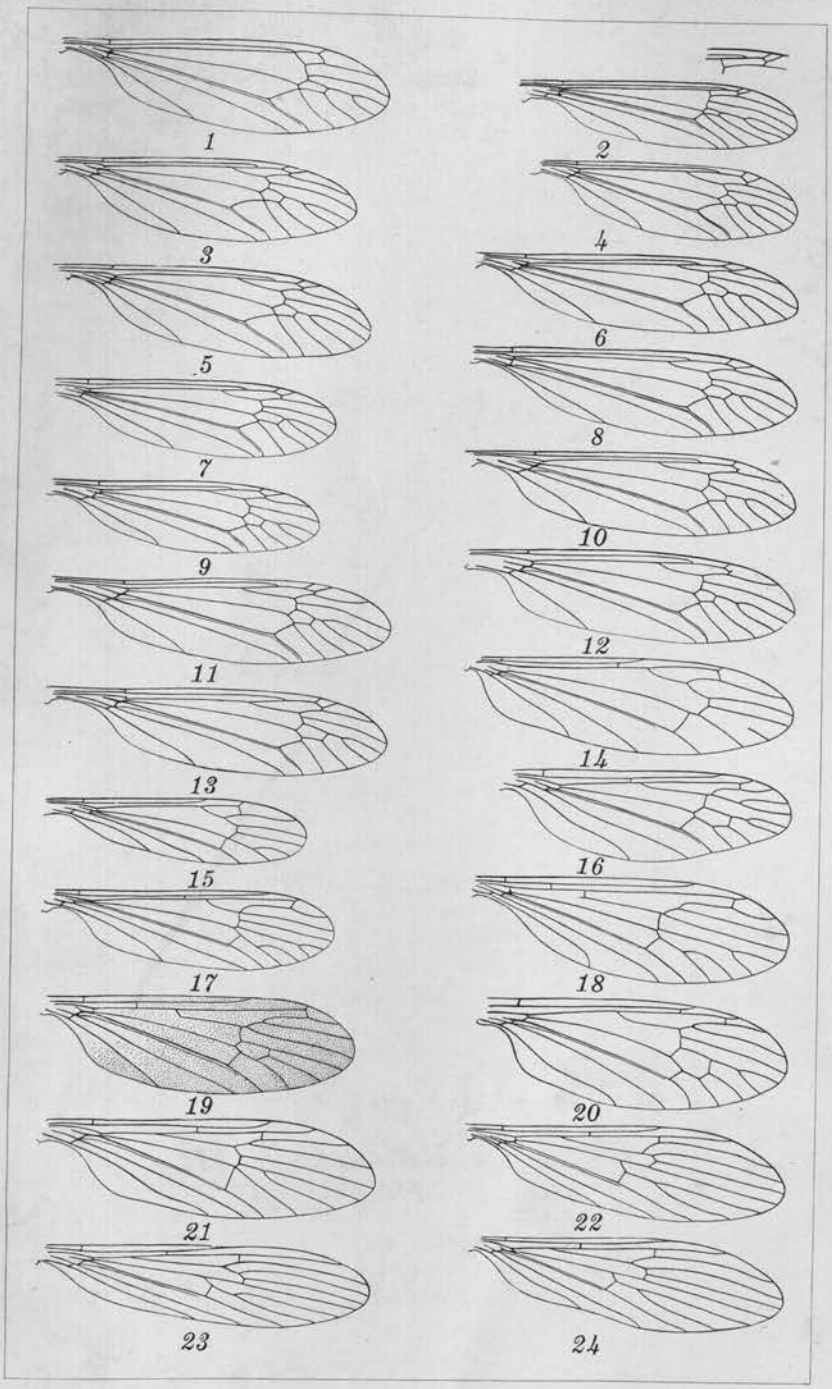

PLATE 1.

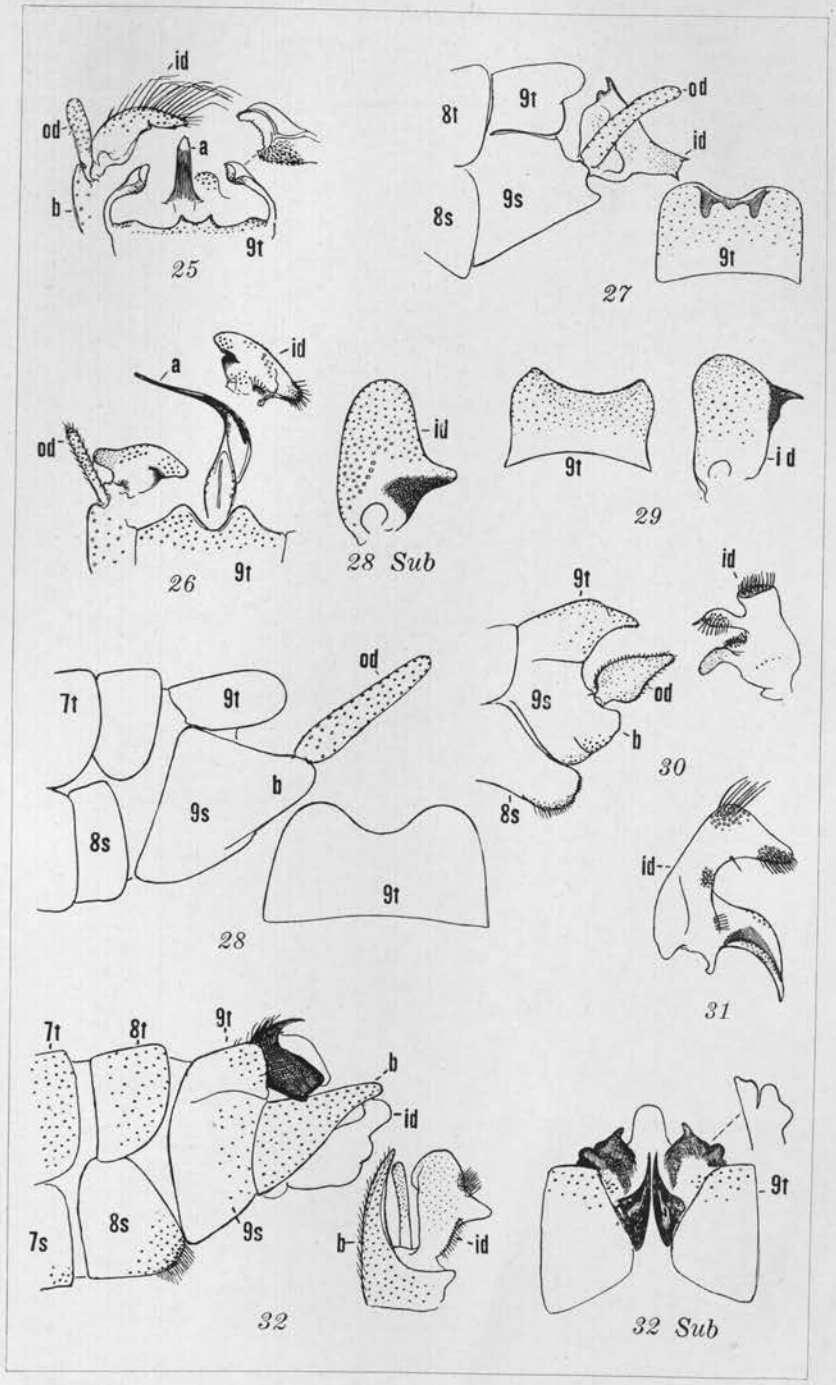
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PLATE 2.

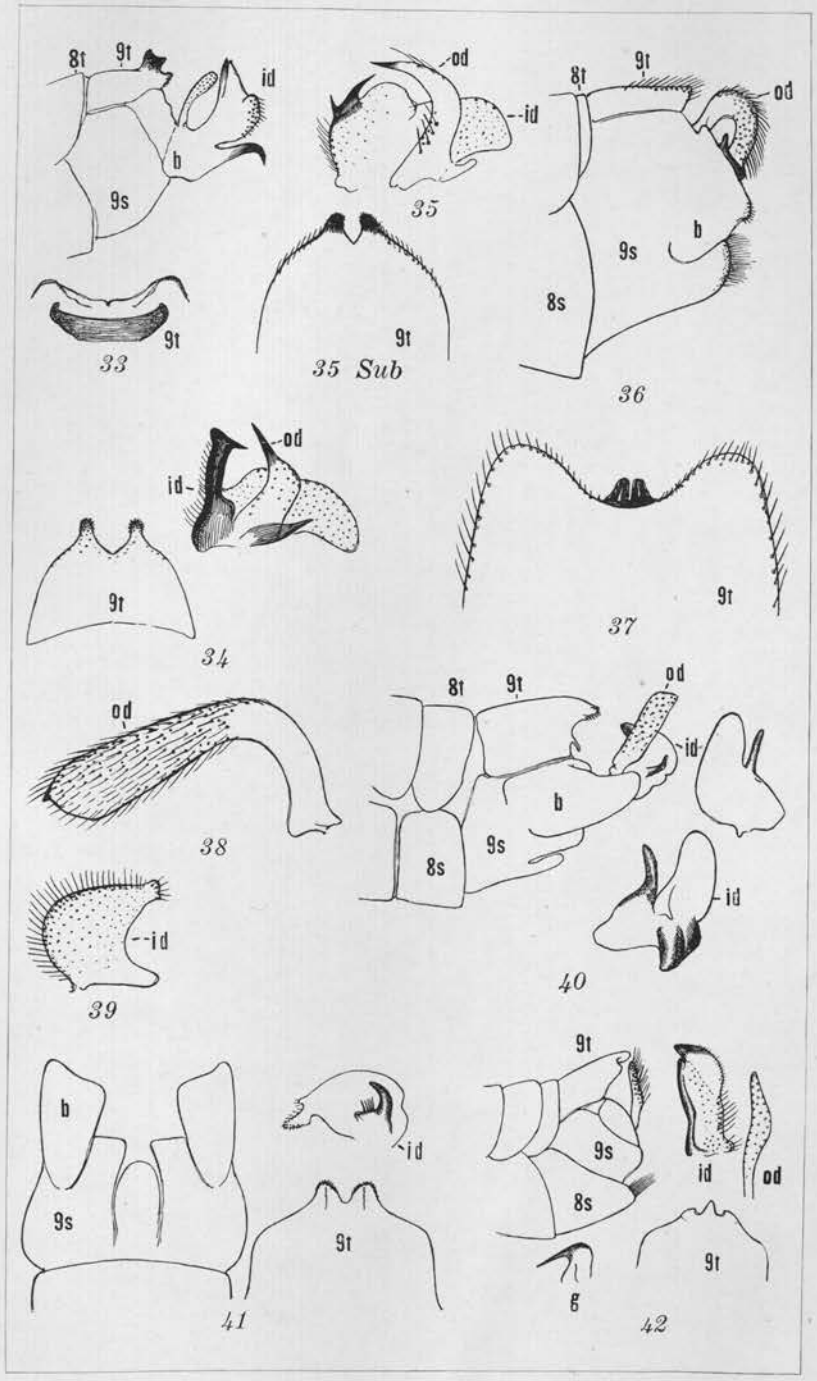
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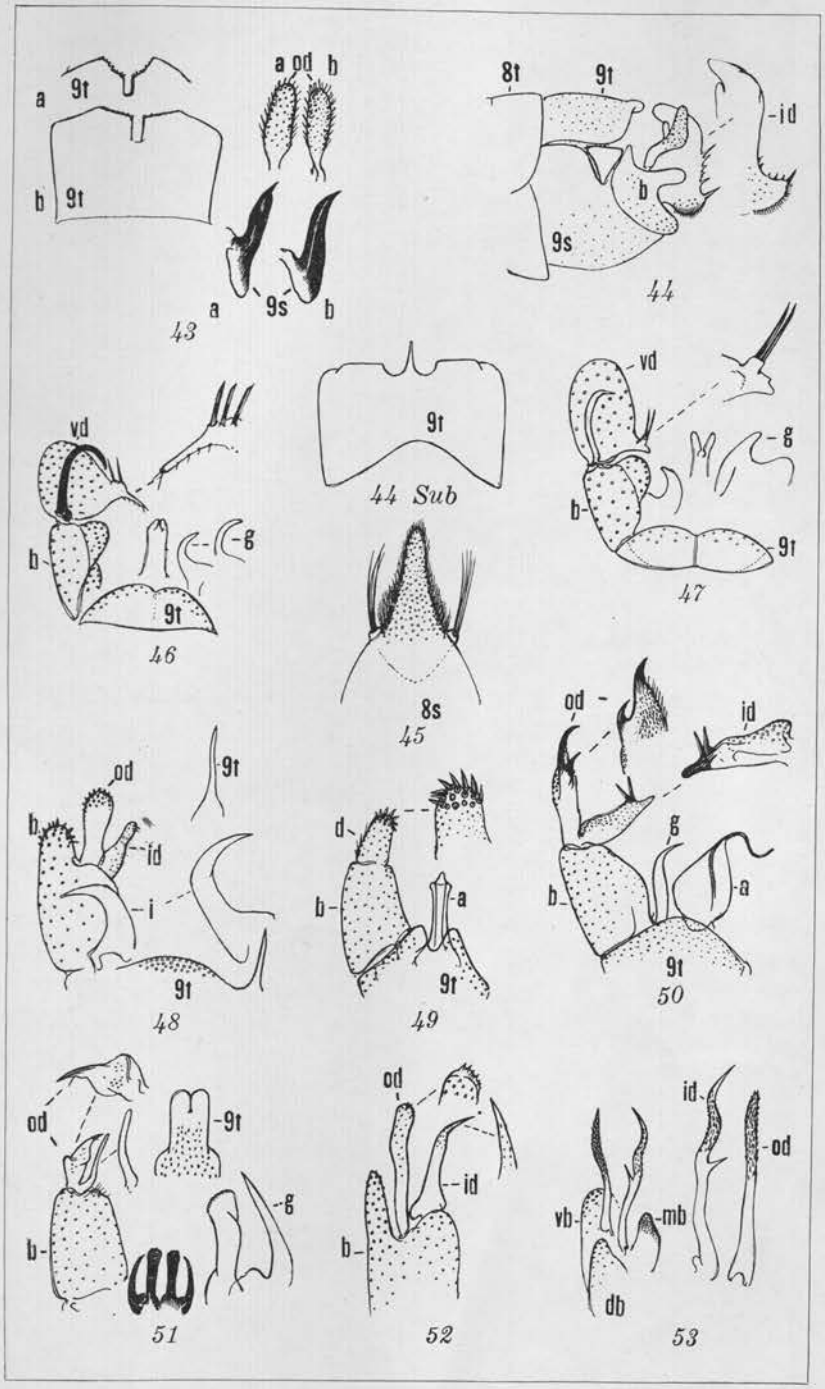
PLATE 3.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db
53

PLATE 4.